The Market for Computerized Composition

John W. Seybold

President, Rocappi, Inc., A Division of The Lehigh Press, Inc.

Printing Industries of America
Computer Section
Washington, D.C.

Copyright ©1969 by Printing Industries of America, Inc.
All rights reserved

CONTENTS

Introduction 7

Chapter I—The Setting. 9
Chapter II—Computerized and Computer-Aided Systems 19
Chapter III—Cost Factors in Computerized Typesetting 29
Chapter IV—Programs and Programming 45
Chapter V—Putting the System Together 51
Chapter VI—Finding the Markets 56
Chapter VII—Developments on the Near Horizon 93
Chapter VIII—Whither Competition? 104
Chapter IX—How Can The Industry Respond? 110

Appendices

I Computer-Typesetting Installations 119
II Some Information Projects. 135
III Bibliography 140
IV Samples 147

Index. 171

With gratitude to Joanne and Martha for their patience and attention to detail in nursing this manuscript through the production stages and permitting the author to update whenever a last minute development occurred.

PREFACE TO THE SECOND EDITION

In the Fall of 1966 the Computer Section commissioned Mr. John W. Seybold to write a report to its members on "The Market for Computerized Composition". This study immediately became an important primer for member firms in establishing their approaches to the use of this new technology.

As Mr. Seybold reported then, the term "revolutionary" can be applied most appropriately to the changes taking place in the field of typesetting. A review of the author's predictions in the first edition shows that while these predictions have proven for the most part to be quite accurate, some developments forecast to take place within five years actually took place in less than two years. These rapid technological advances coupled with the unpredictable nature of their acceptance by the industry, their effects on the printer-publisher relationship, and the advances in computer software, have now warranted this restudy of the field.

The Computer Section owes a debt of gratitude to Mr. Seybold for his efforts in producing this work, just as the entire graphic communications industry owes him its gratitude for his untiring pioneering efforts in harnessing the wonders of electronics for the benefit of us all.

Norman W. Scharpf
Managing Director
PIA Computer Section

March 31, 1969

INTRODUCTION

Changes now taking place in the field of typesetting are so rapid, so profound and so far-reaching that the term "revolutionary" is entirely appropriate. Nothing similar has happened within the field of composition since the 1880's, when Monotype and linecasting machinery were invented. The technological impact of composing-room mechanization during the period 1890-1905 was not without its repercussions—in terms of financial solvency, growth, labor relations, human relations and industry-wide adaptation—but the effects of today's revolution may prove much more complex and upsetting.

This will be true in part because the present revolution is more likely to result in a *re-structuring of the printing industry* since the origins of the change lie outside of the industry and the industry is obliged to borrow and to make extensive use of techniques, equipment, ideas, inventions and especially personnel from other segments of the economy. (If it does not do so, and in any event, these other elements will invade it anyway.) It will also be true because the impact of these changes will be felt equally profoundly among the customers and users of composition and there will be a fruitful but chaotic interplay and dialogue involving not only old friends wrestling with new problems, but new faces as well.

There is every indication that the printing industry no longer stands by itself, if it ever did, and that it is increasingly a part of the "knowledge," "information," or "communications" industry. Those who wish to be players in this new drama of technological change will have to learn new parts; new techniques and even new art forms are also involved. Whether the successful actors will be the heroes of the past or whether, as in the case of talking pictures, new stars will emerge, while old ones are compelled to seek early retirement, remains to be seen.

At the time of the writing of the first edition of this report (October,

1966)[1] the *first* high speed cathode ray tube typesetting device had not yet been installed. At this writing (March, 1969) there are at least 20 commercial installations actually in existence and more or less operational, with another 15 to 20 likely to occur within the next twelve months.

A listing of all commercial computer typesetting installations known to this writer is included as Appendix I to this study. The purpose of adverting to this information at this point is to highlight the rapidity with which change has taken and is taking place. Enough high-speed equipment has been installed in these two short years to produce all of the books published in the United States in the year 1967.[2]

The purpose of this book is to provide the information and perspective on the basis of which printers and publishers can chart their own course. At this stage only insights and illustrations can be given. But these are more than sufficient to pose the challenge and to expose the opportunity. There are risks, too—probably greater risks than most contemporary printers or publishers have ever been invited to take—but these are risks of inaction as well as unwise or premature commitment. It is part of our present assignment to uncover some of these risks and to equate them, at least suggestively, with the probable rewards.

[1] "The Market for Computerized Composition, A Report to Members of the Character Generation Committee of the PIA Computer Section," Printing Industries of America (Restricted Circulation), October 14, 1966.

[2] A total of 28,762 books was produced in 1967 according to the 1968 edition of "The Bowker Annual of Library and Book Trade Information." (R. R. Bowker, N.Y., edited by Phyllis B. Steckler.) See p. 62. (In addition there were 4306 new U.S. Government publications of 50 pages or more.) One Videocomp, Fototronic CRT, or IBM 2680, setting type at a conservative 500 characters per second, could easily generate in twelve months on a one shift basis, enough characters to fill the pages of 2,500 books of average size.

CHAPTER I

THE SETTING

The Nature of the Demand for Printing

It is no secret that the demand for printing is expanding. The almost overwhelming increase in population as well as the higher rate of literacy are two obvious explanations for this growth in demand. And with broader and more universal education there has occurred a decline of parochialism and a widening of horizons—intellectual, social and cultural—enhancing the desire for communication and the need to communicate. The vast untapped market for printing can only be imagined by visualizing the extension and intensification of education at all levels of society throughout the world, and projecting that world two decades forward in terms of the number of souls who will then inhabit the earth.

A peculiar characteristic of the exchange of knowledge and information is its exponential character. A thesis requires rebuttal. One idea stimulates another. Scientists stand on the shoulders of other scientists. It has been said that the accretion of scientific knowledge—as measured in terms of numbers of scientists, volumes of scientific articles and tangible scientific achievements—is such that a present decade encompasses in performance a quantity of output greater than all that has gone before in the recorded history of the world. The proliferation of professional societies with their attendant journals, colloquia and meetings is illustrative of this trend.

Not only is printing called upon to meet the needs for scientific and educational materials, but the widely accepted notion of government by *consensus*—whether in a true democratic tradition or otherwise—has vastly increased the use of printing for purposes of *persuasion*. Persuasiveness is an essential institutional activity for all of those elements which make up the

infrastructure of a society, whether a corporation with a product to market, an organization with a cause to advance, or a vested interest group with an axe to grind. The PTA, AMA, BSA, YMCA, AFL-CIO, the World Council of Churches and the American Kennel Club, or societies for the advancement of colored people or barber shop quartets are an ever-growing feature of the American and indeed the international scene.

There are, of course, media competitive to printing, and these have been receiving a growing proportion of the communications dollar. But printing has special qualities which strongly suggest that its market is not only here to stay but that it is also expanding. This is not to assert that certain uses to which printing is now put—for example, the telephone book—may not disappear. But new and greater markets are opening simultaneously, as we shall indeed be able to demonstrate within the pages of this book.

The market for printing is not only expanding, but at any point of time it is highly *elastic*. In other words, potential consumption is always substantially greater than actual consumption, the cost of printing being the deterrent to its greater exploitation. The high cost of composition has been one of the factors limiting the growth of printing generally. Per-unit press costs, binding costs, art and illustration costs have, in general, tended to come down, especially where volume (in terms of the production of a large number of copies) is required. But composition costs (even on a per-unit basis) have steadily increased except where substitute processes of an admittedly inferior quality have been employed. It is therefore possible to suggest that a reduction in the cost of composition would have a favorable effect upon employment and production in the entire printing and publishing industry.

The Time Element. Printing is almost invariably related to the production of a product which has a *time value*. Oddly enough, a book is both imperishable and highly perishable. To the extent that the production cycle can be foreshortened new products may come into being that could not have been produced before because their value would have disappeared before they reached the market. The slowness of the composition process has been a major obstacle to the production of a timely product.

The Nature of the Demand for Composition

We are all familiar with the increasing utilization of processes which are substitutes for and competitive with conventional typesetting. There is no clear line of demarcation between the market for one technique and another, all being functionally related to the cost, quality and time element implied by the choice of process. Here are some of the methods in common use today:

1. Type characters assembled by hand, especially for display composition and special effects, from type cases or Ludlow matrices.

2. Type characters arranged by hand, also largely for display composition, from manually-operated photo-display devices, or by pasteup or burnishing of pre-prepared images, including extensive "borrowing" of reproduction images from whatever source.

3. "Hot metal" linecasting machine composition, keyboarded directly or produced (not extensively) from TTS tape with so-called "indirect keyboarding."

4. "Hot metal" Monotype composition, keyboarded on characteristic Monotype keyboards, and cast in lines of justified types. Used primarily for high-quality book work, tabular material, and multi-line mathematical formulae.

5. Photocomposition on paper or positive film, directly keyboarded, (as with the Photon 200 or Fotosetter) or indirectly keyboarded via paper tape (as with Linofilm or Fotomatic).

6. Impact (typewriter-like) composition by conventional typewriters, typewriters with proportional spacing qualities, typewriters with interchangeable type fonts, and typewriters with justification capabilities. Some are tape-driven.

7. Impact composition created by magnetic-tape driven MTST (Magnetic Tape Selectric Typewriter).

8. Direct photography from specially-prepared sequential cards, as in the case of Listomatic or Fotolist devices.

9. The photographing of printouts created by data processing equipment, whether computer or unit record systems.

10. Direct reproduction of original source documents, as in the case of producing a union library catalog by the process of photographing library cards, or preparing special cards so that they can be "shingled" and photographed at one time.

11. Photographic reduction of original source documents as in the case of microfilm or micofiche, for subsequent retrieval on demand and possible enlargement and reproduction as composition material.

This list is by no means exhaustive since the imagination is fertile and improvisations are increasingly rampant, but it is indicative of present-day techniques. In many instances more than one such method may be employed on a given job. A computer printout may be reduced photographically, with

rules scribed by hand and headings composed in type, with running heads and folios likewise set and stripped into position.

Many of the processes described above have only been feasible with the printing process of offset lithography. In former years the widespread, if not universal, reliance upon letterpress printing acted as a deterrent to the use of photographic techniques. Photography was a less serviceable handmaiden to the graphic arts when the only method of creating the image carrier was through photoengraving. The refinement and growth of offset lithography has of course provided major impetus to the use of composition techniques other than "hot metal" or foundry type.

If economical letterpress or raised printing plates can be produced from film ("Dycril" and "powderless etch" are said to be too expensive at present to compete with offset plate making) it may be presumed that those few advantages which are still inherent in hot metal typography will be further minimized. At the present time linecasting equipment has an edge in the following areas, in particular:

a.) where there is a substantial investment in existing letterpress equipment (as with the newspapers).

b.) where the nature of the job requires that printing plates be made by a molding process, as with stereotypes, electrotypes, vinyl or rubber plates. The new "belt press" requires flexible rubber or plastic plates.

c.) where a small number of copies is desired, as in the case of a scholastic press, so that the use of type forms and depreciated flatbed equipment is not disadvantageous.

d.) where page makeup requirements favor the manual "spacing out" of material (as by carding or the insertion of leads) and where stripping or pasteup techniques for accomplishing this result would be too expensive or of insufficient quality.

e.) where extensive revisions are likely and stripping or pasteup of changes would compare unfavorably with the handling of slugs of metal.

These are not necessarily the only areas where hot metal composition presently has an inherent advantage over film composition or even over some of the other substitute processes enumerated. But it may be said that computerized composition will have to address itself to some of the problem areas just mentioned if it wishes to straddle the major markets. It is already the case that some computer programs can handle spacing problems and revisions (points *d* and *e* above) more economically than can be done by manual makeup procedures. But it is probable that in some of these areas substi-

tute processes, whether computer-aided or not, will not make inroads for some time. Much will depend upon platemaking developments.[1]

The reader will gather that the present writer feels that computerized composition is incompatible with hot metal typesetting because he links the growth of computer typesetting processes with the use of film typesetting and electronic character generation devices. It is of course true that the computer may be used to produce paper tape to drive hot metal typesetting equipment, whether linecasting or Monotype. In fact, at this point of time the vast majority of computer typesetting installations exist for the purpose of operating linecasting equipment and for some time there will continue to be an attractive area for the use of computers in this context. But the revolution we called attention to at the outset of this study will not be implemented by hot metal typesetting. There are at least two inherent limitations in the metal process which simply cannot be overcome. One of these is *speed.* While metal might be engraved or etched at electronic speeds it cannot be *cast* much faster than at present because casting requires cooling and cooling takes time. Perhaps twenty linecasting machines operating simultaneously in a computerized system would yield an aggregate output approximating that of one of the slower third generation devices, but there is a second and even more restricting characteristic of hot metal setting and that is that such machines are incapable of putting together the various elements that go into page makeup. As the computer solves the problem of full page makeup hot metal will find it increasingly difficult to hold its own even in its most advantageous applications.

So far we have considered the variety of competing composition techniques as viewed from the *supply* side. But these methods of creating or representing type characters are employed in response to *demands* which reflect compelling concerns for *cost* and *timeliness*, even as opposed to quality. However, customers are not at all indifferent to considerations of appearance. Typographic niceties are always desired, and they have their economic aspects in at least the following ways:

a.) proportionally-spaced typeset material in running text can present same-sized characters (vertically speaking) in up to 40% less area, thereby economizing in paper costs, plates, presswork, binding, storage, and mailing costs.

b.) proportionally-spaced type with an attractive format and suffi-

[1] At a conference sponsored by American University, (Institute of Management and Technology in Printing and Publishing, held January 13-15, 1969), Wilmott Lewis, Vice President of the Washington Evening Star, called attention to the development of the *Grace* plate, a flexible letterpress plate produced from a photographic negative. He expressed the opinion that this plate might well provide the desired solution for letterpress newspaper printers who wished to take full advantage of the processes of photocomposition.

cient typographic variety (e.g., italics, bold, small caps, etc.) adds to the value and marketability of the product.

c.) the material so typeset conveys more authority in that it implies less tentativeness, and hence contributes substantially to the end result in those cases where one of the objectives of the printing assignment is persuasiveness.

d.) typeset material, utilizing a range of faces, sizes and weights of type, more readily conveys the precise mood and meaning and more satisfactorily serves the underlying purposes of the author.

We may safely presume that if high quality composition were offered at prices no greater (or not much greater) than those for which inferior substitutes are now used, quality composition would prevail, other things being equal. *Time* is the other thing which may or may not be equal. But here computer-oriented systems can promise an impressive edge.

Relevant General Characteristics of the Printing Industry

In order to appraise the impact of this revolution upon the industry we need to know something about the industry itself. In this report we need not take the time to consider how the structure of the industry could be affected by other developments emerging from the technology of this electronic age (such as the possible elimination of the conventional printing process through electrostatics or the growth of at-home or on-site demand-responsive duplicating techniques) but even the revolution we presently anticipate will have especially profound effects because of the way in which the industry is organized, financed and staffed. At the risk of iterating what is obvious, a few representative characteristics should be touched upon.

1. On the whole the customer *buys* composition, he does not create it himself (except in such instances where he may, for example, supply printouts or original copy to be reproduced photographically).

2. A substantial amount of this composition is produced by trade shops (whether "hot," "cold," or "impact"). Such shops are usually small by modern industry standards.

3. Even those printers who maintain their own composing rooms often buy substantial amounts of composition from trade shops.

4. Despite the existence of such shops it is still the printer, by and large, who "sells" the job to the customer and then purchases his composition, if he does not produce it himself. Occasionally the customer takes the initiative in purchasing composition from one source, printing from another and binding from a third. This is more true in book work than in other fields.

5. While the attractiveness of the job depends in substantial part on the element of composition, and the printing salesman's ability to get the order must presume his capacity to cope creatively with composition problems, the printer's primary interest seems to lie, presently, in the revenue to be derived from the sale of presswork.

6. However, the printer is frequently obliged to "sell" the ability of the composition facility (his own or the trade shop servicing him) to produce the job in a timely way and to communicate constructively with the customer in matters of style, format and alterations.

7. The printer or his internal or external composing facility is required to learn a substantial amount about the customer's expectations with respect to the appearance of the end product, but may know relatively little about the way in which the initial manuscript has been created. In like manner, the customer picks up a smattering (or more) of information about typesetting and printing but is usually not an expert.

8. Although the printer and his salesmen service a number of accounts, they seldom can become professional in their understanding of the requirements of the customer. The printer is a small businessman, employing usually less than 100 persons, selling a product usually valued at less than $1,500,000 per year, with no research or engineering staff, seldom employing cost accountants, seeking to minimize "nonproductive" overhead in order to stay competitive, and concerned primarily with the exigencies of the current production schedule. His product is not one which is mass-produced, and nearly every job requires a creative effort and a degree of coordination, the totality of which consumes, collectively, all of the energies of the enterprise.

9. Management in the printing industry does not generally have access to substantial sums of venture capital. There are relatively few printing corporations with traded securities. Only

limited sums out of earnings are available for research and development expenses, and, while new equipment can usually be acquired through leasing or borrowing, this course is only feasible when anticipated savings are imminent and demonstrable. Extensive costs of creating software (computer programs) and systems cannot usually be financed in this way. Consequently, cooperative undertakings through printers' associations have proved useful in the past, but such an approach suffers from the problems of identifying areas of common interest, reaching agreement on courses of action and methods of equitably sharing costs.[2]

For the reasons just stated industry welcomes ready-made solutions handed over by equipment manufacturers. Presumably the latter would amortize their r & d costs through sale of their computer and typesetting equipment. Unfortunately in the area of computerized composition some of the largest "hardware" manufacturers have not been predisposed to risk large sums for the development of other than the most generalized and elementary solutions. However, there is now evidence that the situation is undergoing change, and more programs—some of a comprehensive nature—are becoming available.

10. The industry is more fractured than it is integrated—in other words, specialized trade shops perform unique tasks under the informal coordination of a major contractor. The elements within the industry are highly competitive and because of the relative ease of entry, profits have not been commensurate with risks or efforts as measured by the opportunities in many other industries.

11. Management people have been drawn from the ranks of the industry, by and large, and have not generally had the benefit of a wider perspective. Their experience has been more frequently taken up with craft or sales problems than with the professional exercise of executive skills.

[2] In December, 1968, a corporation known as PRINT was created through the collective efforts of some eleven companies in the graphic arts industry, due in substantial part to the prodding and encouragement of Bernard Taymans, then president of the national trade association, Printing Industries of America. It is anticipated that perhaps twenty companies will affiliate in a not-for-profit venture aimed at self-education in computer composition techniques, with the conceivable objective of software development and possible sharing of productive facilities.

12. A large number of firms characterizes the industry, but competition between them is not necessarily purely local. National and even international competition exists for certain types of products, such as book composition.

13. Competition often takes the form of a battle of equipment, and where new equipment is not introduced the product is often priced as if it had been.

14. On the other hand, it is generally true that obsolete equipment is not abandoned and the continuation of production from completely depreciated machinery sometimes acts as a deterrent to modernization.

15. In certain areas there is competition between private industry and government, or between the commercial industry and captive printing plants. The government and the captive plants usually have access to substantially larger amounts of capital and professional resources than the commercial industry.

16. Given this setting, a printer can usually survive only by making a successful effort at product differentiation—through superior service and the establishment of a professional, sensitive and knowledgeable relationship with long-standing customers. Composing room activity is frequently the key to this relationship.

The Unique Position of the Composition Industry

For the reasons just suggested, the compositor's role has been vital to the success of the industry and to the growth and welfare of related sectors of the economy. So far as the printer is concerned, composition is often offered as a loss leader. On the other hand, if there is a unique understanding of composition requirements, or a unique service rendered, he who controls the composition may control the entire printing job if he so desires. It is often because of this intimate relationship between customer and typesetter that the printer will maintain his own unprofitable composing room.

On the other hand, there may be compelling reasons why printing and binding should take place at a location remote from the customer, while the necessities of communication have required that composition be adjacent. Within obvious cost constraints facsimile transmission systems and electronic communication devices may change existing locational logistics.

One of the most significant questions posed by the present revolution is whether a trend of the past many years—for the customer to *get out* of the

typesetting business—may not now be subject to reversing influences. If the customer takes over all or some part of the typesetting function the printers' role as a supplier may deteriorate. He will have less to offer in the field of creative services and will be obliged to sell more largely upon the basis of price and equipment. As we shall see, there are now new reasons why the customer may believe that it would be appropriate for him to do his own "typesetting."

CHAPTER II

COMPUTERIZED AND COMPUTER-AIDED COMPOSITION SYSTEMS

No appraisal of markets for computerized composition can be undertaken without first defining the capabilities of computerized composition systems. In this chapter the major features of such systems shall be described.

One-Pass Hot Metal Systems

Although some very early experimental work was carried on by Professor Michael Barnett[1] at M.I.T. on Photon film typesetting equipment and by IBM on Linofilm equipment,[2] the first commercial computer typesetting systems were developed for the operation of linecasting machines in the newspaper industry. These developments occurred in several places almost simultaneously in the fall of 1962. The computer programs (written initially for the RCA 301 or the IBM 1620—both small, general-purpose computers) performed essentially two functions: justification and hyphenation, accepting input from punched paper tape produced by a non-counting perforator unit and turning out, at the other end of the system, in one simultaneous pass, another punched paper tape containing line-for-line messages to activate Linotype or Intertype slug-casting machines.

[1] Barnett, Michael P., *Computer Typesetting, Experiments and Prospects,* The M.I.T. Press, Massachusetts Institute of Technology, Cambridge, Mass. and London, 1965.

[2] *Graphic Composing Techniques,* RADC No. IDR 61-310, Final Report, Contract AF 30 (602)-2527, Thomas J. Watson Research Center, IBM Corporation, Yorktown Heights, N.Y., Feb. 1, 1962.

The raw input tape, to be processed by the computer, includes signals inserted by the perforator to indicate the desired measure and font, as well as codes to identify flush right, center and flush left conditions as well as paragraph endings. Certain other functions, such as leading-out a flush left—flush right line or handling indents and runarounds (all of which are included in the broad term "justification") make these programs more complicated than the mere cumulative addition of brass-width values and the tallying of spacebands. Essentially, however, the *justification* aspect of such programs is merely a matter of determining how much interword space is required (i.e., whether that amount is within the spaceband expansion potential) in order to bring the line within "justification range"—that is, the range within which the mechanical expansion of spaceband wedges will permit casting a line so that it will achieve right and left margin alignment. Where the spaceband expansion potential is not sufficient to meet the demand additional increments of fixed space can be added by the program, either between words or by letterspacing.

In many respects, then, the computer program does little more than that which is already adequately performed by the counting mechanism on a perforator unit. The latter makes two calculations: one to accumulate set (or brass) widths, and the other to keep track of the number of spacebands. If, say, 300 units are required for a given measure, and the characters which have been assembled as matrices equal 270 units, with four interword spaces capable of being set as narrow as five units each and as wide as 12, it is obvious that this line will "justify." At that point, where two indicators (for widths and for number of spaces) come into conjunction, a TTS operator producing "justified" tape strikes the return and elevate signal. The computer program does precisely the same thing.

An added element of sophistication enters when the "end of line decision" also involves the determination as to whether to include only a portion of a word when there is insufficient space for the entire word.[3] A "hyphenation" or word-division program is then required, which ascertains, by an analysis or inspection of that particular word where, if at all, it may be successfully divided.

Originally word division programs were of two types: one used a logic or probability approach, examining combinations of letters to see where a hyphen might be placed; the other used a "dictionary lookup" procedure, comparing the word under scrutiny with an array of words in a dictionary, stored on a random-access disk, on magnetic tape or in "memory" (core) itself, finding the identical word and eliciting its indicated hyphenation points. Today most hyphenation programs are made up of a combination of these two elements: using an analytical system for words which conform to

[3] In some cases a line can be made to justify satisfactorily with or without hyphenation, and the program may be set to select the looser or the tighter solution.

certain general rules and an "exception word dictionary" for those which do not.

It may be seen that a one-pass hot metal system of the sort just described (still the most widely used of any of the computer typesetting programs) merely replaces the operator's end-of-line judgment with that of the computer program. The economy, if any, can arise only from a reduction in the cost of perforating unjustified or "raw" tape as opposed to the punching of justified tape.

Keyboarding mistakes will find their way into the final typeset output. They may also confuse or confound the computer program, especially if those signals which produce the codes for quadding, indenting, font changes and the like are not properly keyed. Nevertheless an intervening proofreading step is not usually attempted. Keyboard errors and typesetting machine errors—the latter being not untypical of linecasting equipment and more likely to occur at the speed attempted in tape operation—are corrected by subsequent manual keyboarding, and the lines containing errors are replaced by the newly-composed substitutes.

A more elaborate variant of this system involves the use of an "allotter" program. Here the computer accepts input from a number of stations (paper tape reading devices), perhaps at semi-remote locations, analyzes the type fonts and measures required and the distribution of the work load, processes the input in an efficient order and activates one of a number of output punches adjacent to the linecasting machine appropriate to the "take" in question.

One-Pass Photocomposition Systems

The hot metal programs just described have been modified or rewritten (where this is necessary) so that they can produce tapes to activate certain photocomposition devices. Such ("first and second generation") machines produce "their own" interword space expansion, either mechanically or electronically, performing in one fashion or another the same function as the spaceband. But many of these machines have to be "told" how wide the characters are that they are expected to "set," not only so that they can perform their justification chore but also so that the proper "escapement" or character "lay-down" can be achieved. Such machines are required to "know" the width of the exposed character so that a prism, lens or carriage mechanism can "escape" or move along the right distance before "laying down" the next character. This knowledge is imparted in one of several ways:

a.) character widths may be pre-stored through the insertion of wired plug boards or printed circuit cards;

b.) such widths may be "loaded" into the memory of the photocomposing machine;

c.) they may be ascertained from an analog signal sensed at the same time that the character is exposed;

d.) they may be provided to the composing device as input codes directly associated with the individual characters that are to be set, on a character-by-character basis;

e.) they may be inherent characteristics of the generated image itself, as in the case of CRT devices which construct their characters from a predetermined number of vertical strokes of a certain dimension.[4]

Although a hot metal program may produce output which will be acceptable to certain photocomposition machines, the greater demands and greater flexibility of photocomposition has encouraged the development of more elaborate computer software. Since phototypesetting machines usually offer a more extended character set, are generally capable of producing more than one size image from the same matrix, more command signals have to be recognized. Film typesetting usually implies more complicated keyboarding techniques than is true for hot metal. Computer programs can simplify the task confronting the perforator operator but greater demands must then be made upon the program. With more fonts to access more tables of setwidth values must be stored; the computer must be larger, or more peripheral equipment must be provided, or the programs must be more imaginative, using memory more economically, overlaying one sub-routine with another. Crude programs may require manual intervention to achieve certain of these results or to insert new tables of width values into designated areas of computer "core." Advanced programs contain sufficient information, in the form of tables stored in memory or on disc, drum or tape and readily accessed, so that all of the data requirements of the photocomposition device can be met with minimal delay and without human assistance.

But in addition to the complications just suggested, which tend to make it difficult and inefficient to modify one-pass hot metal systems for photocomposition, there is another major drawback to such systems when they are applied to "cold" composition. It is not as easy or as inexpensive to make manual corrections of keyboard errors once they appear on film or paper as it is to remove faulty linotype slugs. Hence attention has quite properly been focussed upon techniques for obtaining proof copy and correcting keyboard errors after initial input but prior to typesetting the final product, or even

[4]However, machines of the CRT-display variety usually do not perform justification functions. Justification information is provided by externally-computed signals.

before mounting the initial input (paper or magnetic tape) for computer processing.

There are various ways to obtain such proof copy and to make corrections. It is not our purpose, in this study of markets, to present a definitive summary of all available techniques, but several different principles can be suggested. For example, the "hard" copy or typescript produced as a by-product from some perforating devices can be checked for keyboard errors. One problem with this method is to distinguish between those errors which were detected at the time and which have already been eliminated by strikeovers and "rubouts." Another problem with the proofing of hard copy is that there is often no way to reproduce visually a representation of some of the more important keystrokes—command codes such as flush left. Various kinds of whitespace codes such as ems, ens and thins often cannot be suggested on the hard copy. In other words, the range of input codes required is usually greater than the available supply of striking or printing positions.

Another method of verifying the input tape is to mount it upon some sort of reproducer unit, which reads it and recreates from the signals a new hard copy, representing precisely what has been keyed onto the tape. Simultaneously a new tape can be punched from the same signals. The machine can be arrested and those portions containing errors can be rekeyboarded.

Systems which involve the proofreading of the original hard copy and the splicing or merging of paper tapes prior to computer input are generally makeshift. Moreover, such systems cannot cope adequately with the problem of author's alterations. There are, in fact, at least four separate functions which have to be performed in relation to the input stream:

1. Verification of the accuracy of the input of the original text stream, and correction where necessary.
2. Error diagnosis and correction of instructions, function codes and the like, to assure that the program will not "hang" and will produce desired results in terms of format and general appearance.
3. Modification of the original or corrected input to satisfy the author's demands for greater accuracy, clarity and polish, and to incorporate more up-to-date information.
4. Review and rearrangement of typographic elements in the interest of a product which is more pleasing esthetically, especially where space and format constraints are imperative.

It is evident that these functions cannot be performed in a single-pass system. Just as the major emphasis a few years ago was on justification and hyphenation, now it has turned to editing procedures, pagination programs and other similar "modules" which are part of a total "systems approach."

Multi-phase Systems

In discussing multi-phase systems it should be said at the outset that what may require several passes through a computer in one system can be accomplished in another by a series of complicated but relatively simultaneous manipulations. By "multi-phase" we mean, therefore, that the input which has been read into the computer in the first pass is stored and reprocessed by further computer manipulations after it has been inspected and approved, usually with modifications. Some degree of interim human intervention is therefore implied, although to an increasing extent *programs* will be able to reduce the amount of visual inspection.

The data to be processed will therefore be called back into the computer's work area several times, conceivably in rapid succession but, in many applications, over an extended period of time, allowing for review not only by the internal staff but by the customer as well. The nature of the interim storage medium—whether tape or disc—will be influenced by the volume of material to be stored, the rapidity with which it will have to be accessed, and the time period over which the information, in some form, will need to be retained.

The underlying theory behind multi-phase systems derives from the proposition that the major economies of computer typesetting are to be found in *editing* and *make-up* (pagination) perhaps more than in the simplification of the initial keyboarding process. A one-pass system merely makes end-of-line decisions. In a typical, non-computerized composing room, one third or more of the working force consists of "hand compositors" or "floor men." It is their task to remove erroneous matter detected by in-plant and customer proofreaders, to replace the offending lines, and then to assemble matter set to other (than text) point sizes and measures and to arrange the text, display and related elements into pages. As we shall see, even "one-time" typesetting applications may be produced economically via computer if multi-phase computer programs succeed in eliminating all, or virtually all, hand work. Moreover, it should be self-evident that third generation, high-speed photocomposition devices are utterly impractical unless they operate as part of a typesetting system capable of producing complete pages of error-free and pre-edited output. The task of correcting and assembling by hand anything like the volume of output which would pour out of even a one-shift operation of such a typesetter could only be likened to cleaning the Augean stables.

General Purpose vs. Special Purpose Systems

Programs and systems techniques which may be developed in response to one particular need—such as to produce a listing of members of a profes-

sional association—may not be appropriate or adequate for another situation, such as the production of a multi-column newspaper or a trade journal, with its varied format requirements. It is therefore necessary to distinguish between *general purpose* and *special purpose* computer typesetting equipment and programs, bearing in mind, of course, that no program can be devised which will be applicable to every situation.

First of all, there is special-purpose *equipment.* Examples are typesetting machines that produce "hyphenless justification" from raw tape, or computers that act simply as calculating machines. In the latter instance, when satisfactory justification cannot be obtained without word splitting the word in question is displayed so that a solution may be provided by human intervention.

Special purpose programs are often written for *general purpose computers.* They are usually devised to process one large job, already in machine-readable storage, for one format, to be set on one typesetting device, or to produce a particular and fairly narrow category of work (e.g., all flush left lines, all line printer output, all running text with no tabular) on one type of composing device, from one type of input.

General purpose programs for general purpose computers are of course the most difficult to define and to write. They are also usually slower in the execution of a specialized assignment than would be the case with a program written to do precisely—and only—one particular job. On the other hand, once they are operational they reduce the amount of additional programming effort, they tend toward the development of uniformity within the various elements of the industry, and they are more reliable and less traumatic in their application.

For the most part, in this analysis, we shall be discussing general purpose computers and general purpose typesetting programs aimed at a broad category of work to be typeset on one or more devices capable of achieving a fairly wide range of typographic effects. For the most part, too, we shall be discussing multi-phase systems which imply the review of material in interim stages prior to final typesetting.

One major obstacle to the widespread acceptance of the product of such typesetting systems has not been that it is in any sense inferior to other products. It is rather that the use of such techniques usually implies some adaptation or readjustment on the part of the customer—an adaptation which is both procedural and psychological. Until quite recently, for example, the interim output available for review and inspection by the customer has not resembled the desired typographic product. A computer printout has been offered and while it may be acceptable for in-house applications, such as office proofreading, or for captive use, and resort to it will be imperative for diagnosis of systems failures, it has not met with approval so far as author readership or other external review is concerned. But over the past several

years, with the advent of high-speed photocomposition, it has become possible to overcome the proofing handicap, at least to some degree, by multiple settings. This approach was not feasible, economically speaking, with first or second generation photosetting machines, but in most cases it is practical today. Less accommodation is therefore required of the customer—an objective which has been highly sought but which, unfortunately, may not promote his own ability to work creatively within the framework of the evolving technology.[5]

If we may be excused for being personal, we may make the claim that Rocappi's initial conception was the first to embrace a multi-phase system and it involved the use of computer printouts as simulated galley and page proofs. A great deal of effort and programming ingenuity was applied in order to make these printouts readable. Function codes were removed from the print line and overprints identified upper case characters and non-text type fonts. It may be stated categorically that these printouts found some industry acceptance and that their use has not been confined simply to in-house review. Not only have editors read these printouts, but authors as well, perhaps tolerating them because of their novelty, but cooperating nonetheless. Rocappi personnel explained that such printouts were regarded as transitional in character since it seemed obvious that within a matter of a few years faster and more type-like proofing techniques would be employed.

The next stage in the development of interim proofing readouts consisted of an upper and lower case print chain configuration, resembling a typewriter face. Still ragged on the right (even for "justified" lines)[6] and still limited in its character set, it proved even more acceptable within the industry because of its resemblance to the original manuscript. It is predicted that this type of readout will become very common when used in conjunction with on-line editing procedures, such as IBM's Datatext.

However, the high-speed typesetting device, operating in a "proofing mode," will become the most common method of providing proof copy, in galleys or pages. Customers are somewhat alarmed at this development because they are reluctant, once they have inspected the interim product and approved it, to assume that the final output will in fact correspond with the version previously read and accepted. An act of faith is required, which can only be earned by reliable performance, that the ultimate product will conform in all minute particulars. Once this hurdle has been overcome—and it presumes reliable equipment, programs and procedures—new proofing possibilities will suggest themselves. For example there is no reason why the cus-

[5] It does not follow, however, that all input intended for typesetting prior to inspection will in fact achieve typesetting. Program or input failures may make mandatory an examination of interim printouts.

[6] Lines are justified by the computer for a particular type face or faces of proportionally-spaced type characters. To a computer printer all character widths are alike.

tomer cannot be provided with a version even more legible than the final output is intended to be, and elderly writers may be favored by seeing their galley proofs in well-spaced eighteen point type!

Communicating Systems

An evolving "systems approach" to typesetting, either for extensive editing or for the generation of initial input, is the use of a direct communicating link to the computer-stored manuscript. A typewriter console provides direct input to the computer as well as a playback for review and modification. Editorial revisions to the master file can be accomplished instantaneously, and the corrected version can be presented either at the console or by overnight delivery of computer printouts. Alternatively, visual display on a cathode ray tube can take the place of the computer printout, at least for internal inspection, correction and makeup purposes. A Xerox copy of the material so displayed is also possible where a more permanent record is desired, although this procedure is a relatively slow one. Corrections can be handled either by recourse to an on-line keyboard, or by means of a "light pen," or by a combination of the two.

Present-Day Achievements

In the last two sections we have described, to some extent, what will happen rather than what is now the case. And yet certain of the basic ingredients of such approaches are now operational and all of them are well within the bounds of contemporary technology.

For example, Time-Life presently makes extensive use of the computer to perform hyphenation and justification for the benefit of its editorial processes. An upper and lower case printout is supplied to the editors for review and copyfitting. Corrections and revisions are entered by the use of a line-for-line substitution technique. Final output is transmitted over telephone or teletype lines to the R. R. Donnelley plant in Chicago where TTS tape is produced for hot-metal line casting, or, through a series of computer and conversion manipulatons at Donnelley's, a 31-channel monotype tape is punched for Monotype setting. In some instances the justified hard copy is re-keyboarded by Donnelley on a line-for-line basis. The same Time-Life system supplies paper tape input in New York to a Photon 260 (an automated Photon 200) which is used quite extensively for automated book production.

Beginning about March 1, 1969, *Business Week* has been produced from input generated in the McGraw-Hill building, processed into justified lines by a PDP-8-I computer, corrected and copyfit by inspecting the print-

out from an upper and lower case Potter printer, and transmitted over the wire in eight-level "bytes" to provide input to Harris Fototronic (Model 1200) composing machines—one in the Krueger plant in Brookfield, Wisconsin and the other at the Williams plant in Albany, New York. A similar photosetting device in the McGraw building provides the editors with galleys which they can make up into pages for facsimile transmission to the printing plants where parallel makeup operations will take place.

Several computerized composition centers are encouraging their customers to use Datatext systems to create error-free (but unjustified) input, and others accept, or plan to accept, MTST magnetic tape cartridges. The McCall Corporation has announced its intention of receiving input from great distances, transmitted via satellite.

Optical character recognition is being used more and more extensively, not so much as yet to input manuscripts prepared without regard for their OCR destination but as an alternative to punched card or paper tape input. The original manuscript is retyped at typewriter input speeds, using a font whose scanning characteristics have been programmed, and then converted into digital language by the OCR process.

It may be seen that in the development of systems which encourage editorial participation in the creation of the input, two approaches seem to be emerging: one is concerned with the creation of a text-stream of error-free but unjustified input; the other feeds back to the editorial offices line-justified material for further revision and for copyfitting. At this point there are many systems which do not yet offer the possibility of making corrections except to the initial input or to a "transient storage file" which must be referenced differently from the justified version. Other systems offer complete reprocessibility at any stage, and there are variants where reprocessibility without the necessity of reverting to a previous version of the file is possible at some stages of the "system" and not at others.

In no instance, so far as we know, is on-line intervention possible during the hyphenation and justification pass, or during any computer pass that performs pagination and makeup. Obviously the ideal system, if it can be accomplished within reasonable economic constraints, would be to permit inspection (as on the face of a cathode ray display tube) of justified, hyphenated and paginated material which could be reprocessed instantly, while the viewer observes the results, pursuant to his instructions. Such an approach, especially for running text, is surprisingly complex since the format solution on one page will have its effects on succeeding pages. However, as we shall have occasion to argue elsewhere in this presentation, the flexibility which can be injected into the "system" by certain of the new CRT typesetting devices will be able to minimize substantially the impact of one change upon another.[7]

[7] See Chapter VII for a further discussion of this point.

CHAPTER III

COST FACTORS IN COMPUTERIZED TYPESETTING

Are There Savings In Hyphenation and Justification?

If the computer program merely accepts raw tape and produces a justified tape for typesetting is there any economy to be found? The use of such a technique (the word "system" is hardly applicable since the introduction of this process is usually piecemeal and even haphazard) implies the balancing of computer equipment and operator costs against anticipated savings to be derived either from increased productivity of the keyboarder, lower wages paid to the keyboarder, or both.

Proponents of such simple systems are inclined to claim dramatic benefits, attributable to the introduction of computers, without recognizing that such benefits might be obtainable, at substantially lower costs, without the need to install a computer (certainly not a general-purpose computer) at all.

A computer system should not be compared against manual keyboarding, but rather against the possible costs and benefits of other types of indirect (tape-input) keyboarding. A number of alternative approaches is possible, ranging from TTS input, where the operator still makes his own end-of-line decisions, to "hyphenless justification" devices, or monitoring arrangements (e.g., the *Linasec*) whereby justification is performed automatically and hyphenation by manual assistance.

It is obvious that there are often economies to be realized from indirect keyboarding *per se*. The operator is no longer tied to the typesetting machine. He need no longer be concerned about "hanging" the machine. The ratio of keyboarders to machine monitors can reflect the availability of people during certain hours of the day or week, and can secure a happier accommo-

dation to the demands imposed by the flow of work. Productivity on equipment representing heavier capital investment can be optimized, while less expensive keyboards can sit idle (even in the employee's home).

In order to point up the problem of costing general purpose computer installation it will be helpful for us to consider the alternative of a TTS installation. Both TTS and computer approaches require the use of a perforating device of approximately the same cost. Both approaches use identical tape readers and linotype equipment. Presumably the complement of men or the man-machine ratio for monitoring the linecasting equipment would be the same. Thus the only significant difference lies in the cost of the computer.

The following estimates may be taken as illustrative of the relative outputs and keyboard costs under the two systems, and if the assumptions as to rates of pay seem unrealistic the reader is free to modify them to meet his circumstances. If assumptions as to productivity appear conservative or generous the reader may likewise adjust them according to his predilections.

TTS Operation			Computer Operation		
Wage Cost	Hrly Output	Cost per M Chars.	Wage Cost	Hrly Output	Cost per M Chars.
$4.00	8,000*	$.50	$3.00	12,000*	$.25

*Keystrokes per hour, using for convenience *output* characters rather than input keystrokes. Wage cost includes fringe benefits.

The above figures do not include any consideration for cost center investment because, as we have indicated, it may be presumed that costs are the same in both instances except for the computer. The central question, therefore, is whether the per-unit-of-output computer costs will be greater or less than the indicated margin of about twenty-five cents per thousand output characters. The answer obviously depends upon monthly operating costs for the computer, the throughput speed of the computer and the volume of composition produced during a given period. There is a fourth variable and that is whether the cost of proofreading and making corrections is higher or lower under the computer system.

The reader may be astonished by the relatively low output attributed to the keyboard operator when producing raw tape for computer processing. He may have read dramatic reports emanating from the training courses conducted by Mrs. Lillian Malt,[1] showing that with the elimination of bad habits and with equipment which is responsive to bursts of speed achievable by operators when they encounter familiar letter patterns, a rate of 25,000 to

[1] Malt-Pitman Skills Analysis—Keyboard Training, "*Results of training conducted in Tennessee, U.S.A., October, 1968,*" report issued by the Business Manager's Office, November 29, 1968.

30,000 or even more keystrokes per hour may be attained. However, when we make allowances for the fatigue factor, for lost time due to relief breaks, for queries, and for other disruptions which may interfere with the operator's ability to reach and to maintain his optimum speed, and when we also consider the possibility that certain of these training techniques may be effective for operators who are obliged to produce justified lines, the *ratio* between justified and unjustified output may not be greatly different from what we have suggested. The other factor which is relevant has to do with the length of the line or measure to be set. Obviously the longer the measure (relative to the size of the type face) the greater will be the TTS operator's output relative to that of the keyboarder producing unjustified tape. In the newspaper, where narrow columns prevail, there would appear to be the greatest incentive for moving away from TTS and into computer-aided systems.

At any event, for the sake of illustration we shall stay with the figures we have chosen, and presume that there may be a saving in *keyboarding direct labor cost* of twenty-five cents per thousand keystrokes. At what point does such a saving in direct costs reflect itself in average total costs? For the purposes of analysis, then, let us assume a monthly cost attributable to the computer installation of $5,000, including not only the computer rental (or equivalent figure for interest and depreciation of a computer if purchased outright) but also allocated floor space (air-conditioned), and necessary personnel. *We are assuming absolutely no programming development or training costs.*

The $5,000 monthly figure may be high or low depending upon the computer configuration. It may be too high if a PDP-8 is installed. It is probably too low if the computer is an 1130, or a Honeywell 200. It is most certainly too low if we are considering any model of an IBM-360 or RCA Spectra 70.

Taking $5,000 per month, then, as a kind of "optimum average" fixed cost, we can see that to realize $5,000 worth of monthly saving from the twenty-five cents per thousand keystroke margin it would be necessary to process through the computer and into typesetting approximately 20 million keystrokes per month, or roughly 10 million ems of composition. In terms of book work this amounts to 50 books of 200,000 ems each, or perhaps seven to eight thousand pages. Some ten to fifteen perforator operators would take the place of fifteen to twenty TTS keyboarders, or twenty to twenty-five linecasting machine operators. (As with TTS, machine monitors would still be necessary.)

It follows, then, that if volume is any less than this, or if not all the work produced is conducive to computerization, the computer, *if used exclusively for typesetting in a one-pass system*, is probably uneconomical.

There are other factors to consider: the cost of proofreading and inserting corrections is bound to be higher if only because the reliability of word division (at least in an inexpensive computer system) will probably not equal that achieved by a skilled and knowledgeable operator. If in 100 lines of composition there are 3,000 characters (assume 30 characters per line as in newspaper straight matter) the margin of savings at best would be seventy-five cents. But if there are, out of these 100 lines, 20 lines hyphenated with 90% accuracy, then 1.8 lines will contain errors, necessitating the resetting of 3.6 lines (since word divisions affect two lines). If it costs, say, ten cents per line to proofread and correct a single line, then 36 cents will have to be deducted from the seventy-five cents savings-before-computer-cost, which means, of course, that the volume of composition produced monthly to achieve a break-even point would have to be almost 100% greater.

Hours of Computer Utilization. What kind of hourly costs would one project for computer operations on the basis of a fixed monthly cost of $5,000? This depends, of course, upon the number of hours of utilization projected for the computer based upon anticipated "throughput"—that is, the number of characters processed per operating hour. The throughput speed of most single-pass systems outputting to paper tape is somewhat less than 100 characters per second. If we assume average throughput of 80 characters per second, making allowance for the time required to mount paper tapes, start up the computer, etc., we can assume that 288,000 characters would be processable per hour. It follows, therefore, that approximately 72 hours of computer utilization per month would be required to achieve break-even on the basis of a twenty-five cent potential savings factor. One hundred hours might be necessary to produce the higher volume of output associated with a break-even point which takes into account the probable higher error rate and the cost of correcting same.

It is not easy, however, to get 70 or 100 hours of computer utilization in a month's time:

a.) the flow of work is usually not very even and thus the computer may in fact be running something like 15 minutes out of each hour, or two hours out of eight. Usually this will mean six out of twenty-four.

b.) in some situations, such as in newspapers with tight deadlines, a throughput speed of from 80 to 100 characters per second may be too slow, depending upon how the news breaks.

c.) efficient utilization of the computer requires foolproof programs and fault-free input, otherwise there can be a substantial amount of re-run time.

Our figures on potential savings do not take into account the possibility of using the computer for other than typesetting purposes. If a computer can

be truly justified for other applications then it would of course be appropriate to reduce the monthly burden to reflect the allocation of time projected as between the various uses.

Nor does our analysis consider the possibility of saving due to the performance of functions related to typesetting, such as copycutting (copy allocation), classified ad control, or the derivation of by-products.

Moreover, in our discussion we have not done justice to the possibility of using special-purpose computers and programs. We are concerned primarily with the use of a general purpose computer because the burden of our argument, as we shall see, is that the economic opportunities available to the industry imply the performance of at least some related data-processing functions.

Programming Costs. One further caution needs to be injected at this point. We have assumed no programming costs. If ready-made computer programs exist that meet the needs of the printer, and if they can be supplied at no cost, the above analysis may be valid. However, if it is anticipated that substantial programming activity will be necessary and if the cost of such programs cannot be passed on to the customer, the entire picture changes.

Even where the user does not anticipate an excursion into programming activity he generally will find that he will not be content with the system supplied to him. He will have certain special requirements or modifications for which he will either have to employ outside programming talent or else develop his own in-house programming capability. If he should be rash enough to contemplate the development of all or most of his own programs he will have to anticipate outlays, in terms of staff time and machine usage for de-bugging, which will run in the hundreds of thousands of dollars.

Keyboard Shorthand. Our analysis does not take into account one other area in which dramatic savings may be possible (at the expense, however, of a programming investment). This has to do with the possible utilization of keyboard shorthand techniques. While it is doubtful if there are any substantial economies to be realized from generalized shorthand techniques which eliminate the need to keyboard common words, there are very great advantages arising from the use of code insertions to handle special situations, such as repetitions of last names in a telephone directory, or, for example, in a membership directory of stock traders, the frequent recurrence of "Merrill Lynch, Pierce, Fenner & Smith."

And within the one-pass system there are economies which may arise, even without keyboard shorthand programs, where there are certain format considerations which can be handled once and for all on a given job by a simple code message. An entire job can be set in a hanging indent with only one simple message, whereas the TTS or manual operator would be required to keyboard the amount of fixed space called for at the beginning of every line.

Savings in the Use of Correction Procedures

For the sake of analysis it will be helpful to draw a distinction between "correction procedures" and "editing," although the same techniques may be applicable to both processes and the distinction does not yet have common currency among the cognoscenti.

"Correcting", as we shall use the term, is intended to achieve the same results as "verification"[2]—that is, it is the technique or process of detecting and eliminating human input errors.

Wherever keyboarding is employed as the method of translating manuscript into machine-readable form, and even where optical character recognition ("scanning") obviates the need for such keyboarding, there will be input errors. Transposition of keystrokes is perhaps the most frequent problem but virtually every keyboard operator has his or her idiosyncrasies. The human animal is unfortunately fallible and the art of composition has sometimes been cynically described as consisting in large part of (1) inserting mistakes, (2) discovering them and (3) correcting them.

At this point there are limited opportunities for *programmed discovery*. It is possible to include in the input pass some "housekeeping" functions. It is not difficult, for example, to cause the program to look for and to delete a redundant interword space. A function code that does not conform to a predetermined instruction set can also be flagged. It would even be possible to test every word of input against a massive dictionary; but it is doubtful that a dictionary could be devised which would be sufficiently all-inclusive that colloquialisms, dialects and all word variants could be listed. Moreover, such an interrogation could not detect the right word employed in the wrong context. "Its and "it's," "principal" instead of "principle," and "lovely" instead of "lonely" would be errors that would still persist. There seems to be no substitute for proofreading, or of verifying the contents in some other way.

But the less often the document is re-keyboarded the less often it will be necessary to scrutinize the result of the keyboarding.

We take it as given, therefore, that mistakes will always be injected into the text stream due to human fallibility, and further that there is some possibility of other errors, caused by faulty mechanical or electronic processing in the input stages. Although one can usually read (even "*against the manuscript*") faster than one can type, "verification" is not necessarily more expensive than proofreading; but if verification is not used, or even if it is and subsequent errors are found, it is indeed useful to have available a computer program which will make it possible to correct them.

[2]Technically, "verification" is a method of making corrections which involves duplicate keyboarding. If the second operator fails to strike precisely the same keys in the same sequence as the first the keyboard will lock or otherwise indicate the error condition. The second operator must then determine which of the two inputs is correct and see to it that the proper codes are those that are recorded.

Film composition, as we know, is much more costly and time-consuming to correct than slug casting, but when the correction does not have to be inserted by cutting and stripping one of the major shortcomings of photocomposition is by-passed. How much more economical it is to insert corrections by a computer *file update* procedure depends upon the ease with which the interim output can be read and the nature of the correction routine itself. A program that has the capability of accepting a correction message addressed to any point in the text stream, and which does not require the rekeyboarding of anything other than the address of the error and the correction to be inserted, is indeed a most essential element in a total typesetting "system". The more information the program requires (an entire line, for example, instead of merely the misspelled word), the less the program has to offer—not only because more keystrokes are required but also because there is a greater possibility of making new mistakes.

In the case of a *file update*, however, it is not necessary to carry the correction beyond the line or lines directly concerned. In hot metal, if a word is left out an entire paragraph may have to be reset, with the attendant possibility of error: not so with the *file update* procedure.

Correction routines presently available as part of composition software packages are still poorly conceived. Some of them work only in conjunction with the re-hyphenation and re-justification of the entire file. In other words, those portions of the file which are correct and already arranged in lines are nevertheless re-processed and the identical solution is recorded.

There are, of course, occasions when corrections should be handled manually. A last-minute change in a line or two may best be set by direct keyboarding (if this is possible), and then stripped into position; but the larger the number of corrections, or the more far-reaching the change (in terms of its impact upon subsequent material), the cheaper it is to resort to computer correction capabilities.

Frequently a correction message will affect the line count. In fact, this is usually the case. Consequently the "system" must take into consideration the problem of keeping track of several versions of the same job, making certain that the desired address can be located quickly and that the correction is in fact intended for the address assigned to it. An error check of correction messages is an important part of the routine, so that those messages in improper format or those out of sequence can be identified as having been rejected or improperly inserted. A ready means of examining the portions modified (properly flagged to save the necessity of searching for them) is also essential.

It is probable that the correction runs (and there will usually be several of them) will follow closely upon the heels of the initial input pass. But a system which cannot accept corrections at any stage in the processing sequence is to that degree deficient. It should not be necessary to have to back

up in the production cycle. To do so is not only expensive but difficult. Old versions of the input will have to be recovered and then a visual search has to be made for the lines or blocks of text containing the error. In all probability the old version will also include errors which have subsequently been successfully eliminated but which will re-appear by virtue of reverting to the prior run. Keeping track of the status of the job thus becomes exceedingly complex, and it is not impossible that the expensively-created initial input could be utterly mangled in the process.

It is therefore obvious that a good correction routine contributes more to the economy of the system than a bad one, but the burden of our argument at this point is that a correction pass is an essential element of any computerized photocomposition system, and it is the presence of such a pass that begins to make film typesetting competitive with hot metal.

Savings in Author's Alterations and Copy Editing

So far our concern has been with the elimination of input errors, since they are especially costly in the photocomposition process. But correction procedures (now we shall use the term "editing") offer even greater economies if they are applied to the editorial process as well. Here are some of the ways in which the *text editing* function may be carried out:

a.) use of the correction or revision capability in connection with the creation of the manuscript itself.

(The process of writing is a painful one, involving many false starts, much re-phrasing, and extensive deletions. Thus the manuscript is typed and re-typed, and that which is accepted has to be re-created along with that which is new. On-line text input and editing procedures will prove to be extremely valuable wherever there is any kind of massive authorship effort.)

b.) use of these techniques for editorial review and revision.

(Here the copy editor polishes the phrase, improves the punctuation, brings consistency into the format and style, and imposes "house rules" which are generally unknown to the author.)

c.) review of the partially-processed product in order to ascertain its size and to determine what the page cast-off would be under various format assumptions.

(This may be an essential aspect of the overall evaluation of the manuscript because at this stage cost factors can be appraised and editorial judgments with respect to cutting and abridging may be brought into play.)

d.) inspection of the product to see how it "gets across."

(It is often only at this point that the author discovers the shortcomings of his work and wishes to make extensive changes in it. While it may not be consistent with modern trends in publishing practice to encourage the author to "let himself go", the System must admit of this as a possibility, and there may be some consolation to be derived from the thought that if he does do so the economic consequences may not be disastrous.[3]

e.) review of the product for esthetic considerations.

(Do the pages break well? Are the headings too far down on the page? Is there too little material on a chapter-ending page? Sometimes alterations which are decided upon for esthetic reasons require the addition or deletion of words, sentences or even paragraphs. Sometimes they merely (!) involve rearrangement of the material. Often the authors or editors will be obliged to compromise their preferences in order to avoid a costly chain reaction. Re-writing the final page in one chapter could necessitate assigning new folios to the rest of the book.)

f.) review of the product for purposes of indexing and abstracting.

(If the time cycle required to produce a book is to be appreciably reduced indexers will have to get to work before type—or final type—is set. If books are to be made machine-readable, key words should be inserted at strategic intervals, and abstracts of the argument—overall and chapter-by-chapter(?)—may need to be "locked into" the file.)

What these editing potentials imply. Publishers are all aware of the pitfalls involved in putting their books together. First galleys may be clean and all may seem well, but subsequent changes, paging problems, and the further revisions which they engender may bring about a horrendous result in terms of cost and time. The longer the book is in the making the more prone is the author to want to revise it. The more he revises it, the longer it takes. The more frequent the changes the more extensive are the attendant problems—the indexing must be delayed or revised, front matter must be reset, and so on and on.

What computer composition can offer—especially the high-speed variety associated with CRT typesetting—is:

- Drastically to reduce the time element involved in the process.

[3] To discourage the author from improving his product he may be penalized for doing so by his publisher. We are not qualified to judge whether a reduction in the possible cost of these penalties would constitute a constructive or a destructive contribution to the publishing world.

- To inject much more flexibility—in terms of changes in fonts and formats—and hence to provide additional solutions to the problems of "fit" which confront the publisher and the author.

- To offer a fantastic ability to recover from what might otherwise be a disaster. If the whole book can be set in an hour or so what has gone wrong theretofore may be capable of being rectified without the usual consequences in terms of press and binding schedules, adoption dates and marketing plans.

On the other hand, greater flexibility may invite excessive intervention. While re-runs and recoverability may not be time-consuming they are nevertheless not inexpensive.

The current theory is to guide the book quickly from clean manuscript into print. Once the writer is satisfied with his manuscript, and the editor has put away his blue pencil, then the book should be completed without further delay. Not only will this minimize further author intervention (which is always presumed to be undesirable) with its consequent costs, but the shorter production cycle means that working capital is tied up for a shorter period, with an earlier payoff for both author and publisher.

In the editorial area savings may or may not be realized. They are certainly possible. But the tool will become so powerful that, economical or not, it will be used extensively and soon everyone will wonder how it was ever possible, before computers, to bring a book to press. Copying machines may not save us any money but how could we get along without them? There is a parallel, one suspects, in the application of computers to the process of editing and composing the printed page.

Savings Through Updating and Abridging

In addition to the use of the computer for the elimination of keyboard errors and for the inclusion of author's alterations, there is the possibility of revising a manuscript for a subsequent edition. There is a second possibility—that precisely the same text may need to be reproduced a subsequent year in a different type face and format. Elements of both may be involved in a new edition.

In the event text changes are planned, how much would the existence of a magnetic tape file mean in terms of savings, in contrast to correcting existing pages by conventional techniques? An effort to appraise such savings in terms of a percentage of editorial revision is sometimes attempted, but conclusions are not easy to draw. A ten percent change in text can involve only a nominal cost when made by conventional methods if the ten percent so changed is contained in one chapter at the end of the book. A one percent

change can require very substantial outlays if this one percent is scattered throughout the text, making it necessary to reset entire paragraphs and to rearrange entire pages.

Even the concept of the *proportion* of change requires re-thinking. For example, the addition of one word to a paragraph might represent a one or two percent change if one thinks only in terms of the number of keystrokes stored in some medium. But if one thinks in terms of lines already set which might have to be re-set to accommodate that change we might conclude that the revision sought was major—perhaps total.

It is therefore impossible to generalize about the costs of revisions, except to suggest that if the computer method assumes, as it probably does, that the entire product will be reprocessed through the photo-composing device, we can arrive at certain propositions which may be helpful in visualizing the relevant cost elements.

In general, the cost of initial perforation and proofreading will constitute at least one-third of the cost (external to the publisher) of producing the final product. (We assume the final product to be camera-ready copy—not printed books.) Verified input may well cost more—up to one-half of the per-page cost—depending upon the complexity of the material and the condition of the manuscript. This leaves from fifty to sixty-seven percent to cover the cost of computer processing and photocomposing.

Computer processing will probably represent one-half of the remainder. A subsequent year the computer cost may be somewhat less since some of the input has already been machine-recorded. Here, in actual dollars, is a hypothetical case:

	Initial typesetting via computer composition	Subsequent setting (exclusive of revision costs)
Input and verify	$3.00 per page	.....
Computer processing	2.00 per page	1.50 per page
Photocomposing	2.00 per page	2.00 per page
	$7.00 per page	$3.50 per page

Now if the cost of keyboarding the revisions, and the computer time needed to incorporate them, happened to average $.50 per page, then it may be seen that the resulting $4.00 cost can be compared with those costs that would be incurred in revising pages of standing type, or stripping corrections in film positives or negatives.

The cost of manual revisions has a tendency to mount up, especially if it is film which must be corrected and re-paged. It is therefore advantageous in many cases to reset the entire job via computer techniques. However, one must also consider whether pagination is produced manually or by computer program, and the extent to which the product of the photocomposing device needs to be proofread and corrected for possible machine errors.

It should be evident that a computer typesetting program for film composition which stops short of complete pagination does not begin to exploit the advantages of the photographic composition process, or to minimize its liabilities.

If the prices indicated above for revising and re-setting a hypothetical book seem high, considering that the product is stored (in its original version) in machine-readable form, consider, however, the cost of reproducing the *same version* in a different type face and format as compared with re-setting to accomplish the same effect. There is no reason to suppose that the cost of a second setting, in the proposed new type faces and formats, would cost any more than half of the initial cost of setting; but to produce the new version by conventional methods would be no less expensive than the original.

It should be evident, too, that an abridged version can be produced economically from the original input, either by editing, or by extracting certain pre-coded elements from the unabridged text. The possibilities inherent in this application have not yet begun to be realized and exploited.

Savings in Pagination

Pagination is a term we can apply to the makeup of pages for book work. Similar procedures are required in order to assemble the various elements needed in newspapers and periodicals. Makeup usually implies the gathering together of those portions which were created separately. Except for illustrative material treated as art work (which ultimately will be generated in its proper position from digital storage) almost all of the other elements now assembled by hand can be photocomposed in proper position at one time (within the limitations of the capabilities of the composing device). This is due to the ability of the machine to generate its type images in a variety of sizes and from a number of different fonts. From one Photon disc, for example, it is possible for the Photon 200, or a 500-series machine, to access 16 fonts of 90 characters in twelve sizes. Therefore a great deal of the makeup can be created at the time of initial input. This is true whether or not a computer is employed, but manual keyboarding techniques which command all of the capabilities of these machines are generally exceedingly awkward.

It does not follow, however, that because a typesetting machine is capable of mixing a variety of fonts and sizes, and is also capable of setting "white space," that it is a simple matter, by computer or otherwise, to arrange the elements of type in such a way that they will make a successful page. In many respects page makeup is more easily accomplished in metal. Where the elements to be spaced are numerous it is easier to insert lead and furniture by hand than it is to strip or paste in what could easily amount to a line-by-line assembly. If, for example, the page consists of a number of three or four line listings which may not be broken, but which may be spaced out evenly, page makeup from paper or film galleys is prohibitive in comparison with metal. This is true unless the compositor has access to a computer program which will calculate the amount of space to be inserted before the material is finally set.

The proper spacing of a page may be called "vertical justification," and to perform it successfully requires the use of variable spacing vertically in the same sense that space bands afford variable spacing horizontally.

Where Does the Vertical Variable Space Come From? It may be said that there are two approaches to the vertical spacing problem: one is to permit the addition of expansible space only around heads, captions, tables, and extract. The other is to take liberties with the leading of the basic text itself. This second solution is sometimes resorted to in hot metal by "carding"—a practice which is done more often than is generally admitted—and it is a solution which can be made use of by the computer programmer in his effort to devise pagination solutions. For example, the existing pagination program supplied by the RCA Graphic Systems division for its Videocomp 820 and 830 (for use on Spectra 70 equipment) varies the amount of leading between lines of running text if this is necessary to achieve a balance of facing pages, since it solves each page's problems without reference to preceding or succeeding pages. Since leading can only be handled by the Videocomp 820 in one-half point increments it is possible for a portion of the page to be set ten-on-twelve and another portion ten-on-twelve and one-half.

It may be that the "simulated carding" solution may be more acceptable where leading can be controlled more precisely. For example, the Harris Fototronic CRT responds to signals calling for the addition of as little as a "decipoint" of lead (one-tenth of a point), and the Videocomp 830 can handle leading on one-thirty-second of a point. But even with this machine capability, the distribution of enough leading on one of two facing pages to use up one or more lines (as to avoid a widow) may be considered undesirable by some customers.

The conventional method of making galleys into pages is not a matter of solving one page finally and then proceeding to another, but rather of moving lines and spaces back and forth, from page to page until the optimum solution has been achieved.

A full-blown pagination program would have to have this capability unless standards for good book work are changed. The program should also be able to move footnotes, position illustrations and tabular matter, and apply white space in esthetically-satisfying proportions. It goes without saying, of course, that "widows" are to be avoided.

It should be evident that such a program cannot be developed, except possibly with the greatest ingenuity, for a medium-scale computer. An adequate general-purpose pagination program could profitably take advantage of a core large enough to hold the number of characters that are required to set two or more pages of text. Thus, taking into consideration the possibility of multi-column material, as much as 30,000 "bytes" could be devoted to work area alone. Obviously a memory of this size increases the cost of the computer and likewise affects the cost elements associated with other passes, such as hyphenation and justification.

Another aspect of pagination presents itself in connection with the problem of arranging multiple-column material on a page. The most economical way to set such material is often to compose it "across the page" so that the first lines of columns one, two and three are laid down in one sweep, before the paper or film advances to the next position.[4] But there are two considerations which may inhibit such setting apart from the possible inability of the typesetting device to compose a measure of such length. One problem is that multi-column setting implies a great deal more *font mixing* than is the case with single column setting. For example, if there should be a passage in italics in the second column, each "line" would start in roman, change to italic, and then change back to roman for the third column, and this would involve more such changes than if the italic material were composed serially within its own column. Whether or not this challenge poses a problem depends upon the nature of the typesetting device. For example, a CRT composer which must re-load fonts into its memory every time it changes from one type face to another would obviously take either more computer time, or more typesetting time, or both, to produce the kind of material, across-the-page, that we have just described.

A second, and more obvious, problem inherent in much multi-column setting has to do with whether or not the matter to be composed is set in all three columns consistently on the same leading—as, for example, eight-on-eight. If this is to be the case, then obviously any effort to achieve vertical justification by adding small elements of white space (less than the base leading of a line) is out of the question, and so the page must either have a ragged bottom or there will be occasional awkward breaks at the ends of columns and pages. To avoid this, and to enhance the capability of pagination programs to achieve multi-column pagination more economically in terms of

[4] This statement is not necessarily applicable to the Linotron 1010, which composes an entire page on the face of the CRT tube before any film or paper advance takes place.

both computer and photo-unit time, more reliance will be placed upon certain of the new machines that can "reverse lead." It is not then necessary to set from left to right across the entire face of the page, (including type and the white space in those columns where no type appears because of leading differences between columns). Each vertically-justified column can be set as an entity by itself.

Low- Versus High-Speed Typesetting Systems. It does not seem very likely that many users would want to install high-speed typesetting equipment for the purpose of doing book work without having available to them a very flexible and competent pagination capability. It is conceivable that a supplier might specialize in the typesetting of galleys for the customer's own makeup, but he would need many customers if he hoped to justify his installation on such a basis.

Unless they do have a good pagination program the high-speed typesetters will have to content themselves with the production of a limited class of work which requires a very limited set of formats. This is, of course, the class of work that most such installations hope to secure, or, better yet, have in hand at the time they make their major equipment move.

At this point of time it appears that the kind of computer required to perform all of the necesssary typesetting functions must be at least in the medium size range, if not in fact larger. Rentals here will run from $10,000 to $18,000 per month. This obviously implies that a very large volume of type will need to be processed if the computer cost is to be supported primarily on the basis of its dedication to typesetting. On the other hand, since the typesetting tasks to be performed are much more complicated than mere hyphenation and justification, the processing of a given quantity of material—say one million ems—will obviously take longer. The relationship between fixed cost and throughput speed therefore becomes exceedingly complex. In a multi-phase system there may be many processing runs. For example:

1. Initial input from paper to magnetic tape.
2. A correction or verification run.
3. A hyphenation and justification pass, to produce galleys.
4. An edit run, to incorporate author's alterations.
5. A pagination run.
6. Perhaps a pagination modification run.
7. An output pass to prepare input to the typesetting device.

The pagination run itself may be relatively slow. The output pass may require a great deal more time than one might suspect. This will depend upon the nature of the work and the kind of typesetting device selected. The

wrong job on the wrong machine could result in as much as ten hours of computer time *devoted to the output pass alone* for one hour of typesetting time!

It should be evident, therefore, that no categorical answers to the question of *savings through computer typesetting* can be provided. If ever there was a field where informed and dispassionate analysis is required this is one. And yet the glamor of flashing lights and the magic of belonging to the computer "in-group" may entice even the most wary businessman to set aside his customary acumen and to take an irrational plunge—especially if he comes to believe that doing something—almost anything—is better than to do nothing!

CHAPTER IV

PROGRAMS AND PROGRAMMING

General Concepts

In order to discuss this subject with any degree of depth it will be necessary to provide the reader with a brief introduction to the *mystique* of computer terminology and concepts. Those who are already well versed in this area may wish to skip this discussion and proceed immediately to the next chapter.

Hardware and Software. *Hardware* means the boxes, wires, transistors and other physical properties of the computer system, including the manner in which the parts are wired together. The computer's "instruction set" is part of its hardware. The computer is able to receive and execute instructions such as "compare" or "add" or "read" or "print" because it is wired to do so.

Software means the computer programs or the specific sequence of commands, utilizing the computer's instruction set. A *program* is a sequential set of instructions usually involving the following elements:

a.) program is loaded into computer memory.

b.) input data are provided.

c.) first instruction calls for reading of some portion of input data.

d.) subsequent instructions call for manipulation of those data.

e.) at some point, data so manipulated are "output" as on a line printer.

f.) program loops back and picks up more data.

g.) when no more input data are found program terminates.

This very crude outline is obviously intended only to be suggestive.

To some extent, *hardware* can replace *software.* For example, a computer might contain a wired instruction which, on command, would cause it to multiply one item by another and to come up with the result. Absent that instruction a program can be written to take the *add* instruction and increment the item by itself, tallying the number of times it did so, until it produced the same result.

More complex hardware means, in general, that there is a larger instruction set and that therefore fewer instructions are necessary to execute a given job. More complex software may mean that a relatively limited instruction set can be used to execute a sophisticated series of commands, or perhaps that a computer with a small memory may be called upon to perform the tasks usually assigned to a computer with greater capabilities.

Hardware is divided, in general, into:

a.) input devices, such as card reader, paper tape reader, optical scanner, magnetic tape station, on-line keyboards or consoles.

b.) central processing unit which executes the necessary commands and contains the required controls.

c.) external storage devices, such as magnetic tape stations, discs, drums, "data cells" and other pieces of equipment which provide *random* or *sequential* access to the stored data.

d.) output devices, such as a card punch, an on-line printer, a magnetic tape station, a paper tape punch, an on-line typesetting unit, or a signal causing some type of device (as in process control) to turn itself on or off.

Off-line and On-line. On-line implies that the input or output device is directly connected to and serviced by a computer. Off-line means that some manual intervention is required, such as removing a magnetic tape from an on-line station and mounting it on an off-line tape station where it can be read as input to an off-line printer. Hence magnetic tape stations can be on- or off- line, printers can be on- or off- line, keyboards can be on- or off- line.

On-line Time Sharing. When one or more input or output devices is being operated more or less simultaneously, executing completely different programs in response to different sets of commands which are not functionally related, the computer is said to be "time-shared," or "multi-programmed." The latter occurs when only a portion of the computer's "core" or "memory" needs to be devoted to the performance of a certain task, so that other portions may be assigned to perform other tasks. "Time-sharing" takes place where the central processor is being dedicated to the performance of only

one task for a split second so that it can serve a number of different users without each being aware, in any substantial degree, of the existence of the others.

Operating System. An operating system is an arrangement whereby the computer, subject to a general set of instructions (sometimes called the "supervisor") takes command of the series of tasks set out for it to do, often determining the sequence or priority of the tasks before it, and allocates the necessary capacity and equipment configuration (within the limits of what is given) in order to execute the assignments. Operating assistance, when required, such as the mounting of specific tapes, will be signalled by the computer.

An operating system will usually require that a supervisor program reside in core at all times, while the balance of the programs will be called upon (from disc or tape storage) as necessary. An operating system which is not intended for the implementation of *time-sharing* or *multi-programming* need not be resident in core but may be brought back into core again upon the completion of a given program. Such an operating system is designed primarily to facilitate the operator's performance of tasks of which he himself keeps command, but it would not be necessary for him to be familiar with each step in the operational procedure, since the system is designed to lead him on.

Internal Speeds and "Throughput." There are always constraints and limitations of time in connection with the operation of any computer system. The speed of the computer in executing a single command when that command relates only to the manipulation of information already lodged within the computer's memory may be expressed in milliseconds, microseconds, or, more probably nowadays, nanoseconds, but the speed required to obtain the needed information from *outside* of core will be limited by the design specifications of the input reader (the number of punched cards that can be read in a minute, for example), the number of channels available for the conveyance of that information to the central processor, and the speed with which such information may be communicated over these channels.

In like manner, the speed in disposing of the information (outputting it) may be governed by the rate at which a line printer or a paper tape punch can operate. Programs are "computer-bound" when the limitations imposed upon their speed derive from the length of time it takes the central processing unit to execute the required instructions (and this may also be the consequence of poor programming), or "input" or "output bound" if the central processing unit cannot function at its capacity because of the delay in getting or recording information. Specifically, a program may be "punch bound" or "paper tape read bound" or "printer bound." When this occurs there is of course more incentive for time sharing so that the computer may execute other tasks while waiting.

It is possible, too, for a given program to be input bound at one stage, computer bound at another, and output bound at a third.

Computer languages. Programs are written in one of the following languages:

1. machine language
2. basic assembly language
3. compiler language

Machine language is that language which is directly read and understood by the computer itself. A program written in machine language provides a set of codes which are lodged directly within the computer core for the execution of the desired task, and the specific location of every piece of information must be identified by core location. For example, the coding will instruction the computer to read an item which will be found in core location 2400-2409, to add it to an item which will be found in core location 3400-3409, and to write out this result at core location 4400-4409.

Such programs are tedious to write and difficult to encode. But most important of all, if it is subsequently necessary to modify them, as it almost always is, the program has to be re-incoded because the core location referred to will no longer be applicable (if a major program is involved) since the addition of instructions will occasion the need to re-assign the use of core. The easiest way to modify these programs is to "patch" them—that is, to squeeze in an instruction which refers control from its normal sequential processing to another location in memory and, upon completion of the new routine, returns to the position in core where the next instruction would be found. Not only does such a "patch" take up room in memory with its instruction to "go to" and then "go back to" but the documentation and subsequent modification of such programs becomes virtually impossible.

A basic assembly language is one step removed from machine language. Instructions are written in virtually the same way, but the programmer or encoder does not assign core locations. He gives each such location a "tag" or name which is unique. The assembly encoder is then run against his program and for every tag an appropriate core location is assigned. If he wishes to add another instruction he does so, at the proper place, and a new assembly will reassign core to accommodate his new requirements. Thus there need be no "patches." Moreover, the format of programming "in assembly" provides an opportunity to include explanations which furnish a great deal of the documentation necessary for a subsequent understanding of and analysis of the program.

A compiler language, such as Cobol, Algol, Fortran or PL-1, is designed to make the programming task much easier. The programmer now uses "tags" not merely to describe core locations, but to describe operations as

well. Those tags embrace not just one instruction but an entire set of instructions or routines. A word like "Fetch" can be used to encompass a number of instructions involving reading in the data, comparing it, and placing it at a given location.

The programmer is now no longer working with the instruction set of his particular computer. He is at least one step removed. He does not need to know specifically what his computer's instruction set is. All he needs to know is that, somehow, the compiler program will call upon the proper sequence of machine language instructions. In other words, the Fortran compiler will be run against his program, for example, and his program will then be translated into the machine language—instructions and core locations—which is applicable to his computer configuration and to the requirements of his job.

One major advantage of writing programs in a compiler language is that to some degree the programs become independent of any computer hardware and the user is free to move from one hardware supplier to another or from one "generation" of computer to another. Those who have written programs in machine language or in basic assembly language and then wish to update their computer configuration are often faced with a very expensive and very difficult task of re-writing.

On the other hand, there are drawbacks to a reliance upon compiler programs. The reader is cautioned that generalizations are difficult in this area where there is still substantial room for differences of opinion, but the following observations may be considered as cautions in connection with the decision to use Cobol, PL-1 or any other compiler language for the development of what we may term "production programs"—that is, programs which are to be used over and over to execute repetitive assignments, as contrasted with "research" programs which are one-time in character, and are no longer needed once an answer has been determined:

1. Although the programs require substantially less time to write, they are generally believed to take longer to "execute." In other words they are less efficient in terms of throughput speed. This is true in part because the programs may not be written for a particular computer but for computers in general. Obviously such programs will be more efficient in one situation than in another, depending upon how good the supplier's compiler program is, and how applicable his hardware is for the tasks to be performed.

2. Not only are such programs believed to be less efficient in terms of the length of time it takes them to perform their tasks, but also, and perhaps even more notably, in terms of the number of instructions and the amount of core which must be dedicated to the performance of the task and the storage of the program. In

other words, to gain program universality and program-writing economy a high price may be paid for the need to utilize a larger and more expensive computer on which the program may also run more slowly than a machine-language type program on a smaller computer. And if multi-programming or time-sharing are involved the need for larger core and the longer time the program takes to run will have consequences with respect to total computer utilization.

3. The compiler programs may prove not to be as universal as one might have hoped. A program written in Fortran for one computer configuration may not run at all upon another make and configuration of computer. Size of core, the existence of the appropriate peripherals, and the efficiency of the supplier's compiler are all relevant factors.

4. Certain kinds of operations may not be capable of being performed in the language of the compiler. In general, each type of compiler language, such as Fortran, or Algol or Cobol, was devised to handle certain types of data. They were not intended to be all things to all people. The demands of computer typesetting are not the same as those for business or scientific data processing.

It may be seen, therefore, that decisions with respect to the selection of a computer and its peripherals, the design of the typesetting systems concept, and the language within which this concept is to be expressed are all exceedingly complex and full of pitfalls. Some of these will be explored in the chapter which follows.

CHAPTER V

PUTTING THE SYSTEM TOGETHER

Several years ago this writer prepared a "Questionnaire for Computerized Composition Software Analysis,"[1] which was published by the PIA Computer Section's Character Generation Committee in 1968. The purpose of this questionnaire was to assist a possible user to distinguish between the irresponsible claims that uninformed and over-enthusiastic hardware salesmen are prone to make, and the hard realities of program capability, and also to provide some standards of comparison as between competing software and hardware packages offered or likely to be offered. In some respects the questionnaire provided a definition of the essential elements of a software package for typesetting. While the reader is encouraged to obtain a copy of that questionnaire for reference, it may be helpful to call attention to certain aspects of the questionnaire at this time.

Questions relating to size and cost of computer.

- Minimum configuration of equipment for which the programming system is available.
- Cost (rental and purchase) of each of the elements in the computer configuration.
- Size of "words" in core location, number of bits required to describe a character, number of words required to store one instruction, and method of describing an upper case character (to get some idea of effective size of computer core).

[1] Printing Industries of America, Inc., Washington, D.C. Prepared in collaboration with the Character Generation Committee, W. W. Tunnicliffe, Chairman.

Questions relating to program documentation.

- Language in which program is written.
- Presence or absence of program documentation available to user.

Questions relating to the nature and capabilities of program.

- Single-pass system. (What is throughput speed?)
- Multi-pass system. (What are the passes? What is throughput speed for each?) How is interim product stored?
- Modularity of program.
  More than one type of input device?
  Output to more than one type of typesetting device?
- Nature and kind of justification.
  Does program "justify" or only bring within "justification range"?
  Can it handle line length changes, quadding left, right and center, flushing left and right in same line, leadering out, various kinds of indents, nesting indents?
  What does it do about ligatures? (Are they keyboarded uniquely, or generated? How are they hyphenated?)
  How many tables of width values can be accommodated at one time? (What is time factor if table overlays are used?)
  Can parameters of interword space be changed? Can they be set uniquely for each type face?
  Can program set justified and ragged, hyphenation or non-hyphenation?
  How does program cope with justification where word spacing would be excessive?
  Can program cope with character kerning?
  What are program's tabular setting capabilities?

Questions relating to hyphenation.

- Number of characters left, number of characters carried forward, size of word hyphenated, possibility of use of different hyphenation "levels," claims as to accuracy and frequency, presence or absence of an exception word dictionary, whether or not the dictionary is expandable, whether it is always searched, minimum access time to find a given word, average time to search, maximum access time, whether program looks at entire word or only a portion of it, how program copes with compound words, whether it really "hyphenates" or merely "syllabifies," whether there are controls on the number of successive hyphens, how program copes with combinations of characters which are not wholly alphabetic.

Questions relating to corrections and editing.

- Whether a printout is provided and if so at what stage; how much of text requires correction (entire line or word only), how characters are represented that cannot be found on print chain or printout device.

Questions relating to pagination.

- Whether capability exists at all. How program would cope with footnotes, with space (as for illustrations), movement from single column to double column format, widow elimination, insertion of running heads and folios, balancing facing pages, performing vertical justification, across-the-page formatting of multiple column material.

To the list of questions just enumerated it is desirable to add many others.

Questions relating to ability of program to output to other typesetting devices.

- Whether program is predicated upon a given unit system (such as 18 units to the em in relative units) or can be used to express finer increments in absolute unit terms.
- Whether program is capable of handling a wide variety of special characters, fonts and sizes, so that it can take advantage of the new machine capability of varying character height (point size) independently of character width (set size).
- Whether program can cope with small increments of vertical white space, such as tenths or thirty-seconds of a point.
- Whether program can position characters above or below normal base line even when such characters are normally base-aligned.

Questions relating to ability of program to function in a time-sharing or multiprogrammed environment.

- How much core each phase requires, what its throughput potential is, how much manual intervention if any would be necessary to load fonts, parameters, etc.

Questions relating to ability of program to interface with conventional data processing computer runs.

- Whether program can cope with sort output, or provide sort input, can accept fixed-field format data and insert necessary typographic instructions.

Questions relating to capability of typesetting or character-generating equipment which is part of the system.

- Whether device runs from paper tape or magnetic tape.
- Compatibility requirements for paper and/or magnetic tape.
- Limitation to the width of measure that can be set.
- Range of type faces available without manual intervention.
- Range of point sizes available without manual intervention.
- Whether machine can handle variations in height (point size) independently of width (set size).
- Whether machine possesses capability of obliquing, condensing, or expanding characters.
- Whether machine can handle odd point sizes, such as half points.
- Smallest leading increments which can be handled.
- Whether machine has reverse leading capability.
- Whether film carriage movement can add to the effective width of page or measure which can be set.
- Size of typesetting machine's "memory"—i.e., how many characters can it "remember" at one time?
- How machine obtains its set-width information and whether these widths can be changed for individual characters without manual intervention.
- How font changes are accomplished and how much manual intervention, if any, is required when it is desired to change the fonts which are resident within the machine.
- Whether any special computer passes are required in order to prepare the font information for the typesetting device and what the ratio of time is between computer and typesetting device when such special font information must be provided in the middle of a job.

Even a cursory examination of these questions will indicate the degree of inter-relationship between computer hardware, typesetting hardware, and computer software, again underscoring the need for a systems concept. The "System" includes the hardware, the program concepts and the programs themselves. Rational assumptions must underlie the system, including a projection of the scale of activities to be carried on, the degree of exclusivity with which the cost center will be devoted to the composition function, and a certain set of expectations concerning the degree of permanence of the separate elements (and all of them) which will permit the writing-off of heavy initial costs.

A harmonious relationship between all the elements in the system may not be achievable. A computer too big for the typesetting capability, a typesetting device with an appetite which exceeds the capacity of the computer system to satisfy it, a set of programs which do not relate intelligently to the hardware requirements of the system, and which do not perform the entire task expected of them—these are some of the hazards, and it may almost appear that an effective putting together of all of the elements of the System may rather be fortuitous than planned.

Because of the problem of meshing together into a coherent and economical combination all of the elements of the System, it should be evident that a successful installation must consist of modules or building blocks which can be combined in such a way as to provide the optimum response to the market place in an evolutionary environment. This implies, for example, that the output device—the typesetter or character generating machine—must be independent of the other elements in the System. The System, in its fundamental aspects, cannot afford to be device-dependent.

Conversely, the software approach must take into account not only the capabilities of existing equipment but also of desired capabilities of equipment not yet designed. For example, a pagination solution is obviously simpler if it is possible to inject small increments of leading (like "carding") of linecasting slugs. Some of the new CRT devices have the ability to "lead" in units of one tenth of a point or less. A pagination solution designed for hardware which did not have this facility should nevertheless take into account the advantage that could be afforded by recourse to this solution under some circumstances. The addition of this feature minimizes the impact of revisions upon the re-pagination problem.

In the initial stages of a computer typesetting installation a Photon 713, one or more Linofilms or Linofilm Quicks, or a Fototronic, for example, would appear to offer enough capacity and flexibility and would seem to combine well with a medium-sized computer installation at a cost which, while not modest, may, with luck, be supportable. But in the fast moving area of competition, customers will shortly come to demand more capability in terms of turn-around time, page widths and type flexibility than certain of these interim systems can promise to deliver. Ultimately, we believe, type designers for high quality work will invariably specify the kinds of individualized solutions to their assignments which only certain of the CRT devices will be able to achieve.

If the system concept will not permit moving from the electro-mechanical device to the CRT, or away from paper tape input to the product of OCR or on-line editing consoles—in other words, if the initial system is highly device-dependent—then it may prove necessary to scrap it and start afresh long before it has begun to pay for itself.

CHAPTER VI

FINDING THE MARKETS

The preceding discussion of the economic aspects of computerized and computer-aided composition, and the exposition of software and hardware, was not intended to be definitive, but to provide a background for our effort to seek and identify the principal markets which presently exist or which, it is expected, will shortly come into being.

Markets will be discussed under two general headings: existing markets where computerized composition may compete effectively with existing techniques, and new markets uniquely applicable to this method of composition, or which are brought into being by the computer itself.

Existing Markets

Where the One-Pass System Can Compete. For hot metal (linecasting) composition a computer system can be economical for straight matter provided the volume is large enough. This kind of operation must be quite comparable to that of a large metropolitan daily: limited measures, limited fonts, absence of special typographic characters, very little tabular material. The essential element to consider is the sheer volume of the work, with perhaps a limited time schedule available for its production. The alternative approach would be TTS setting through justifying keyboards. A cheap computer and a simple program could make this approach attractive, but special purpose computers should also be considered.

Standards of typographic quality should not be high for this class of work. Letterspacing and illogical word divisions will be tolerated. But competition will nevertheless be keen from manual setting, especially in foreign countries. Thus the computer method will be utilized for the most part where

the volume is derived from "in-house" publications, and where time does not permit going abroad or to a distant domestic low-cost typesetting area.

Film composition may also be reasonably economical, even through a one-pass system, where the volume of material to be set is substantial enough, where the composition, though more complex than hot metal, can be standardized, as in the case of in-house setting, and where manual stripping of corrected lines can be tolerated because the quality is low and the accuracy of the perforator operators is high. Film typesetting devices such as the Photon 713, the Fairchild 2020, the Linofilm Quick or Superquick, or one of the Compugraphic models, can also be operated from non-computer justified tape, but keyboarding of such material, when utilizing the full potential of the device—in terms of fonts and sizes—is likely to be cumbersome. The ability of the computer to store many more tables of width values than can be accessed without manual assistance from a justifying keyboard is one of the factors which may make even a one-time, single-pass computer approach relatively economical. In other words, the higher cost of stripping in corrections (as compared to replacing slugs) may be offset by the greater flexibility of the film typesetting device when activated by a reasonably satisfactory computer program.

It is our opinion that the most logical market for this application is the processing of captive work: suburban newspapers (though the competition with the MTSC will be keen), in-house periodicals produced in very considerable volume with a great deal of uniformity of treatment in terms of type faces and styles, the ganging up of "takes" and even of the setting of correction lines (to be inserted manually)—all of these things suggest captive operation or contract typesetting.

Where the Multi-Pass System Can Compete. In referring to a multi-pass system we are assuming correction capability and pagination. We assume, moreover, that these programs are available at no cost or virtually no cost, that they are more than adequate for their purposes, and that they will run on a medium-scale computer. At the time of this writing there are very few such programs in existence but it is only a matter of time until they become available.

Book Composition. We are of the opinion that one important market is book composition. Here film typesetting has a natural advantage due to the variety of type faces desired on many jobs. This is especially true for text books, less true for trade books. At this point of time book composition which is heavily interspersed with multi-level equations, chemical formulae and underlined phrases would have to be avoided, although the task of programming these elements is not so complicated as many people seem to think. The limitation has more to do with the size of computer core available than with the programming itself.

There is a strong economic justification for the setting of book composi-

tion by computerized methods, even for so-called "one-time" setting, where there are no by-products and a subsequent version is not foreseen. Until recently a contrary opinion was generally held in the industry, which this writer has never shared. Our own experience now enables us to state categorically that this technique can compete effectively with hot metal and manually-keyboarded film setting. This may not be the most profitable field to enter, but it need not be unprofitable. What must be avoided is the single assignment because there are too many problems of interpretation and communication to support the overhead required to launch a one-book project with any publisher. However, we suspect that this generalization would be true for any kind of composition. Some degree of standardization is essential, and a scheduled work-flow is also mandatory. This does not mean that all books will have to look alike: there are many variables that can be brought into play. It does mean, however, that each book will be made up of a selection of options, starting with type faces and continuing with specifications for the treatment of extracts, footnotes, heads, figure captions and the like.

It is our conclusion that computers make film typesetting devices feasible when they would not otherwise be so. Photocomposition can do many things better than hot metal. It can mix more fonts and sizes. It can handle white space without the necessity of filling it in with quads, leads or furniture, and it can compose lines and pages at fantastic speeds never achievable with metal. The fact that it cannot deliver a product from which printing can take place directly, or from which type can be molded, will shortly cease to be a limitation. The letterpress platemaking science is rapidly improving, and there are also techniques for composing directly upon the face of the printing plate even if, at this moment, this is a short-run multilith-type plate.

Until computer programs were developed there were, however, serious drawbacks to the filmsetting process. The high cost of inserting corrections, including matching the density of the lines which were stripped with the rest of the material on the page; and the difficulty of making up certain types of material—these were perhaps the two biggest problems. To explain the second point—when an entire page has to be "spaced out," as contrasted with spacing only between a few of the elements on the page, then manual photosetting can lead to disaster.

It may be seen, then, that the advantages of photocomposition make it necessary to set pages which are error-free and where the requirements of page makeup have already been anticipated. Multi-column formats can also be set advantageously where the material can be arranged to be set across the page on fixed leading, where the typesetting device is capable of accurate and reliable *reverse leading*, or where an entire page can be displayed at once on the face of the CRT.

The major drawback for book composition has been the problem of supplying a satisfactory proof. Increasingly, especially with upper and lower

case printers, computer printouts are gaining ground. But it is also possible, and it may be feasible economically, to offer a multiple setting of the same product: first in galleys and then in pages, or perhaps twice into pages. The initial setting need not be in the same format and indeed proofreading may be facilitated by setting in larger point sizes.

Setting the job more than once is only possible when the typesetting device can guarantee accurate results. If the photocomposing machine makes mistakes—especially small ones that are difficult to detect—the advantage of procedures which deliver final pages is offset by the added proofreading burdens.

It is in the area of reducing the cost of author's alterations that the greatest economies may be brought into play. If we were to look at the invoice submitted by the typical composition house we would find little resemblance between the final price and the original quotation. In fact, in competitive situations the compositor may deliberately set the quoted per-page price very low, realizing that once he has the manuscript in his grasp, if there are changes (as there most certainly will be) the profitability of the assignment may be amply recovered.

How can publishers address themselves to the business of cutting alteration costs? We have already suggested that some of these costs may be reduced if the publisher takes over the task of providing the computer house with clean and edited magnetic tape input. A second approach is so to reduce the time cycle that there will be less need for such changes, and less opportunity to insert them. A third way in which changes can be avoided is by virtue of eliminating inconsistencies in style through standardization of formats.

But when changes are desired after the manuscript has been input and a printout or a proof version has been provided, there are certain types of revisions which will cost much less than previously. Obviously, a decision to restyle the book, changing face, measure, format, page depth and the like, can be done at modest cost in contrast with the alternative of starting back from the beginning and incurring virtually all of the same charges over again. It is also obvious that the addition of a word which requires the resetting of the paragraph, or of a paragraph which necessitates re-making the page, or of the page, which has to be worked out through the balance of the chapter, or of the chapter, which makes it necessary to re-folio the entire book—these are alterations which the computer can do faithfully and well, and at great economic advantage.

Economies in Book Design. Another area for money-saving is in the initial cast-off of the book. This is often done prior to editing. The compositor tells the editor how many pages the book will make if set in a certain face and measure and the editor and the compositor together have the task of making the book fit into a rigid format of even signatures. To put a book together in this way is like designing a house from the outside. Given the exterior dimen-

sions, either the bathroom will have to be reduced in size or a closet eliminated from the master bedroom. Much of this tyranny of the book signature may be eliminated by using the "belt press"[1] for printing, together with perfect binding, but it is also possible to achieve the desired fit by trying out another computer pass which lengthens the measure slightly or adds another line to the page. Nor should we lose sight of the ability of certain CRT machines to set type with varying degrees of compression and expansion, or with unusual increments of leading (such as a ten point face, nine set, on 9.2 leading). Additional economies may be offered not only in terms of accommodating to the Procrustean bed of the 16- or 32-page signature, but also by reducing the overall size of the book. New CRT type faces will be created which can be used more flexibly and imaginatively than most existing styles. And CRT typesetting, with the exception of the Linotron 505, cannot be performed except with the aid of a computer program.

Storage of Text. Another area in which there are conspicuous advantages is where material to be typeset this year will be stored and revised for subsequent typesetting at a later date, especially where such revision implies repagination. Or, of course two versions could be set simultaneously from the same input—one for a paper back and one for a hard cover edition. Single-column and two-column versions of texts can also be provided for different markets, and large type editions can be produced for those with poor vision.

Typesetting the Product of Editorial Computerization. Finally, as we have already suggested, in any case where the input can be derived from editorial computer manipulation, so that there will be no assignable cost for input and verification, or where the cost, even if assignable, is less than the cost of re-creating and re-proofing the input, there is perhaps the greatest advantage of all, since input will continue to be one of the largest cost elements in the composition of a book. We turn now, to a more detailed discussion of this topic.

Potential Cost Saving in Editing Systems. In the early stages of the computer typesetting revolution very little attention was paid to the problem of input and input verification. Attention quite understandably was centered upon justification, hyphenation, correction and pagination software, and also upon the development of reliable, high-speed, high-quality composition machines. Now, however, more and more attention is being devoted to the input problem. It is recognized, for example, that certain computer composition programs demand too much assistance from the perforator operator and from mark-up personnel. In other words, they are not *input-oriented* programs or systems. Modifications are now being made which add simplicity and flexibility to the input code requirements. "Macro" instructions are

[1] Our references to this radical new type of press assume the reader's general familiarity with printing developments. For information on the Cameron product see the article by Victor Strauss in *Publishers' Weekly,* January 6, 1969, p. 58 ff.

more widely used and cut down keyboarding and mark-up time at the expense of more computer utilization.

Another development has been a marked improvement in keyboard design. Newer keyboards are inherently faster, simpler to operate, less conducive to fatigue, and in some cases more reliable. Those keyboard errors which are detected when made are more easily eliminated because their signals are held in a buffer until released.

The keyboard becomes more and more similar to an office typewriter and hence it is perhaps not so difficult to imagine that the secretary, the editor, or the author may be able to create usable input.

Beyond this, we can conceive of many situations in which the keyboard-computer interface simplifies the author's and editor's tasks, so that not only is the customer "home free" on the cost of keyboarding and proofreading, but he gains other substantial advantages as well.

Compelled by the simple logistical task of providing sufficient input for high-speed typesetting, and profiting by the opportunity to discover editorial savings, certain of the larger typesetter suppliers of computerized composition have already launched major campaigns to encourage others to create their own input. Early in 1969, Alphanumeric began a campaign featuring double spreads in many of the trade journals, publicizing their *Textran* program and encouraging the use of Datatext and MTST keyboards. The reader is told that only a few simple codes are necessary and that these can be added in the final stages of editorial preparation. An on-line system of input creation which would be applicable to editorial offices as well as to computer typesetting establishments is offered by Astrocomp[2] utilizing a PDP-8-L with up to eight DEC Tapes and IBM Selectric on-line keyboards. General Electric also offers an on-line text editing capability and there can be no doubt but that we are just beginning to witness a confusing and complicated proliferation of input alternatives.

Among these is optical character recognition. Multi-font scanners of typewriter faces are now being supplemented by devices that are able to read printed matter with varying degrees of success. For example, Dissly Systems, Inc., in Easton, Pennsylvania, offers the facilities of an OCR service center using Scan-Data equipment and this writer has observed one of its scanners at work on the pages of a telephone directory and another handling a book manuscript. Mergenthaler also has a scanner under development and trial input is presently being produced for Automatech, the Linotron 1010 installation in New York City. Other service bureaus, using more conventional

[2]It is not possible to list all of the suppliers of hardware or software, or of entrants into the computerized composition business. Our selection of company names and products is admittedly arbitrary. We mention only those illustrations that come to mind because of recent contact or recent receipt of literature. Endorsement is not implied nor do we intend to suggest that there may not be many others performing similar services or producing products like those mentioned in these pages.

OCR devices, such as Data Central in St. Louis, are soliciting manuscripts for conversion into machine language. In many cases these manuscripts are re-typed in a face that the scanner can cope with most advantageously. The use by Perry Publications of Recognition Equipment scanners is too well known to require exposition here.[3]

None of the devices we have mentioned, when applied to the scanning task in commercial production, is entirely trouble-free. Dots or specks on the input document cause difficulties. Hyphens occur where they are not wanted. Zeros are hard to distinguish from capital O's, the letter "ell" resembles a "one," and lower case g's and q's are often misread. Capital Z's look very much like the number "2" and it is impossible to differentiate between various kinds of spaces except by program. When reading typeset material there are ligatures and accents, differences in fonts and styles of type, and other perplexing problems. Some scanners are not troubled by the task of reading type of different sizes as if they were all alike, and this is of course a liability as well as an asset, as one may imagine when visualizing the frequent use of caps and small caps.

Yet there can be no doubt that OCR will have a place not only for the recapture of previously typeset material, but as a means of obtaining economical input from edited manuscripts. Some apparently feel that this is already the case. Others see this development as a few years further removed, but there are already instances in which practical and economical input has been achieved.

To the extent that machine-readable data can be provided direct from editorial offices, either via OCR or as a result of editorial input, the computer typesetting industry enters into a whole new ball game. Then there can no longer be any cause for speculation about economic feasibility. It will be up to the publisher to judge whether to use these methods or not. Once he does he is committed to computer typesetting.

Evaluation of Book Composition Potential by a Publisher.

Just as the preparation of this manuscript reached its final stages a profound and well-reasoned article by Leonard Shatzkin appeared in Publishers' Weekly (April 7, 1969), entitled "Some Effects of Computer Composition on the Editorial Process in Book Publishing."

Mr. Shatzkin is vice-president for manufacturing research and development at the McGraw-Hill Book Company, and he speaks from direct experience of many years with the book manufacturing industry. In this article Shatzkin emphasizes that "it is only by carrying computerization far beyond the functions of hyphenation and justification. . . that we can apply the computer to text composition in ways which are exciting, revolutionary and economically beneficial."

[3] See bibliography for more information about the Perry approach.

He defines computerized composition "as a system in which the manuscript is introduced by keyboarding, optical character reading or a combination of the two—the correctness of the reading and/or keyboarding is somehow verified—complete typographic instructions are given to the computer—the computer produces a tape which matches these typographic instructions with the keyboarded manuscript and this tape drives a cathode ray composition machine to produce film in finished page form, ready for platemaking. A short, sweet and inexpensive distance between two points."

He goes on to say that this process differs greatly from the backing and filling, awkward long-windedness of present methods, "and the potential difference was made possible by technology which, for the first time since Gutenberg, changes the relationship. . . between the editor and the manufacturing process."

"In my opinion," he continues, "the revolutionary feature of computerized composition is that for the very first time in the history of typesetting it is no longer necessary to verify the result of the work. The tape that drives the machine has *complete control of the result.* The customer—meaning the publisher—can have tighter control over every conceivable facet of the composition than he has ever had before, and without even raising his voice."

The present process is not only time-consuming, but the need to check for printers' errors undetected by the printer "provides the opportunity for reconsidering the manuscript itself, and making changes in it after it is in type. . . While the printer pays for correcting his own mistakes, the publisher pays for these author's alterations. How expensive are they? Well, at McGraw-Hill for the one year I totalled them, $456,000. We can certainly put that money to much better use."

Most author's alterations, according to Shatzkin, consist either of changes that could have been anticipated in the manuscript and did not require typesetting to come to light, or changes that simply represented two points of view, "with the second no better than the first."

In order to save money and time, Mr. Shatzkin favors a *verification* approach. "If the publisher prepares the tape, he need not verify any outsider's work. If the time that the tape will be ready can be predicted, the succeeding steps can be scheduled very precisely—and they are fast." He continues as follows:

> First of all, please notice that the problem of verification is immensely simplified. We are now concerned with one thing only—do the keystrokes and the manuscript correspond? That is absolutely all that concerns us. Each character in the manuscript calls for a certain keystroke and each keystroke means a certain character in the manuscript. This is a one-to-one relationship in which there is no ambiguity and no need—or even opportunity—to exercise esthetic, literary or managerial judgment.
>
> All the auxiliary instructions such as typeface, length of line, spacing, handling of sideheads, footnotes, index entries, chapter openings, etc. are

on an auxiliary magnetic tape which has been checked and rechecked and is exactly the way the publisher wants it.

Since the problem is a strictly mechanical one, involving no need for judgment—no management decisions, no literary taste, simply determining whether each character has resulted in the correct keystroke—it is insulting to pass this job back to the author or the editor. Nor does it make much sense to put the tape through the typesetting routines (even at high speed and low resolution as some have suggested) to get some sort of type to read. To what purpose? Each trip through the system is costly.

An ordinary computer printout, producible at very low cost, is perfectly adequate. It is true that a printout will not look like type, that it will have to include coding marks to indicate italic and bold and odd characters, and so on. This presents no real difficulty, and will, in fact, help experienced hands detect wrong keystrokes because they won't be distracted by the typography.

New Markets

Typesetting in Relation to Data Processing. It is now our intention to discuss two new types of markets. One has to do with the creation of new files for typesetting *and related data processing.* The other is the possible market for typesetting from data processing files which have already been created for other purposes. In the first case we visualize that typesetting is the entire purpose of the undertaking, and that data processing is merely the means to getting the job done most expeditiously and economically.[4] In the second case we are conceptualizing typesetting which is more or less an incidental by-product: the files exist already for other purposes.

Obviously these distinctions are arbitrary and unrealistic, although in the past few years it has been helpful to conceive of the market in these terms. As more and more people become aware of the availability of type as an alternative to the computer printout, and as publishers explore in greater depth the conversion of their book products to non-book data banks it will no longer be possible to think differently about these two applications.

At the moment, however, there is a valid reason for drawing the distinction, and this is because the first situation contemplates the creation of a new data file with typesetting (and typesetting codes for an extended character set) in mind; the second poses the problem of how to obtain typesetting information from a file which was not set up for this purpose. In this phase of our analysis we shall be concerned with the former: that is, the creation of a new data bank or data file with the purpose of typesetting in mind.

For the most part, such a file will consist of "entries" of items. It is not likely that there will be running text, as in a novel or text book, although

[4] By "data processing" in this context we mean something other than the performance of computer typesetting functions. This will become clear as we proceed.

textual descriptions within the items may be fairly extensive. The data processing functions which will be performed upon this file may be described as:

1.) resequencing
2.) extraction
3.) explosion
4.) retrieval

Resequencing, or the Rearrangement of Data. There are occasions when the information to be typeset becomes available out of final sequence. One such project was a world atlas index. The customer could make available a list of places and geographical features when one map or plate was completed. This would provide all of the listings on that plate, together with other relevant information about the listing, such as the grid location of the town or feature in question. But the object was to develop a comprehensive index which interfiled all names regardless of the plate on which they appeared. Hence it was necessary to devise a method of input which would permit the presentation of the data in sort fields and also in typesetting format. Obviously proofing had to be performed prior to the re-sequencing operation. By the time the last map was completed all of the entries had been input and verified so that the sequential arrangement of the entire series of 135,000 listings could be undertaken.[5] The sort necessary in this particular instance was exceedingly complicated because, while logical, it was not, strictly speaking, alphabetical, and there were many accented characters which had to be specially encoded.

As a second illustration, a directory of faculty, staff and administration members of a large mid-western university was input as these names became available and then sorted after the closing data for this publication had been received.

It is obvious that this method is far superior to one which makes it necessary to postpone keyboarding until the last entry is ready, and then all must be arranged in proper order. It is evident, too, that an *editorial function,* namely, sorting or filing, has also been performed—usually more reliably, economically and expeditiously than if 3 x 5 filing cards had to be rearranged. In the entire world of indexing and classification there is probably nothing more frustrating and demeaning than placing *b* after *a.*

A third illustration is an index to an annual publication which lists and describes new products. Each product is coded for several index listings. As pages are made up and the location of the product description is thus determined the index items can be keyboarded. The sort takes place after all entries have been input. Not much time is saved but at this point every day is precious and all of the tedious hand-sorting is eliminated.

[5] World Atlas Index, National Geographic Society, Washington, D.C., 1966.

A fourth case comes to mind where it was desired to input all of the data relevant to scientific papers that were to be presented at a colloquium (name of speaker, title of paper, abstract of paper, names of commentators) and then to assign the sequence of speakers, the time of their papers, and the location of the meeting rooms at the last minute, and to sort by date, time of day and meeting room location.

In our third illustration there is an added element of "explosion" of data, although it is relatively minor in this case. Disregarding that aspect for the moment, it can be seen that what is primarily involved is the use of the computer's sorting capability as well as its typesetting programs. A competitive method of producing this type of product is the sequential card camera. The superiority of computer typesetting over a sequential camera should be readily apparent when we consider the elements of the sequential camera approach.

There are two ways in which a listing can be produced by the use of a sequential camera. One method is to order the cards by manual sorting and then to feed them to a camera device which photographs them (entry by entry or line by line) as the listings appear on the card. The image on the card could be placed there by imprinting from linecasting slugs or impact typing from Varitype and other proportionally-spaced typewriter faces.

The second method involves the use of machine sorting. The cards are imprinted in much the same way, except that each card is also keypunched for sorting. Less manual sequencing is thus necessary prior to the use of the sequential camera.

Taking both of these possible methods into consideration, we can enumerate the advantages of the computer as follows:

1. When sequential cards are also punched there are two keyboarding operations instead of one. One provides the attractive type face for reproduction; the other puts in the holes for sorting. Only one keyboarding is required for computer sorting and setting.

2. Sorting time by computer is much faster, more economical and it can be carried forward to many more places, thus assuring better results and eliminating the necessity for the many hand changes which would otherwise be required for final refinements in the sort. Punched card sorting must be performed letter-by-letter, one pass at a time, and in fact several sorts are usually necessary for each letter position because there is an insufficient number of pockets on a card sorter in which to arrange the cards. Even if each letter could be sorted in one pass, a ten letter sort would involve passing the cards (or some of

them) 26^{10} times. Only one computer sort can order a field of eighty or more characters.

3. The entry need not be frozen so far as the designation of sort fields or textual appearance are concerned. With sequential cards generally only one sequencing operation is performed. If a second listing is desired from the same information new cards are usually prepared, involving more input. With computer input many alternative sorts are possible from the same data, and the sequence of the information within an entry (the text elements) can be rearranged and restyled. A new type face can be assigned for each context in which the entry is used. Hence an author's name can be bold in the author-title listing, and the title can be in italic. The reverse can be true for the title-author list.

4. The file is permanent, whereas one must exercise great care in the handling of sequential cards lest they be mutilated or soiled.

The market for the type of sorting and sequencing operations we have just described is obviously large. A computer typesetting center must necessarily familiarize itself with sort and merge programs and may wish to create its own. The sort programs provided by computer manufacturers are usually rather limited in character set and may not be easily manipulated to achieve the desired sequencing results. Moreover the computer typesetter must devise a bridge between his typesetting program and the sort program. Perhaps he must strip the sort fields of function codes, font codes and the like. He must move from a variable length computer record to a fixed field format.

It will also be necessary for the typesetter to learn a great deal about sequencing rules in various applications and to discover how to achieve the desired results. This will imply a great deal of communication with those of his customer's staff who are knowledgeable in this area. Usually the customer has evolved rules and procedures which appear logical on the surface and which are sacrosanct, but which in reality have not been thought through from the standpoint of a mechanistic program. Usually, too, they contain inconsistencies which will not be uncovered until the job is well under way.

There will be a tendency for the specialists who have been custodians of the data to resist computerization because of their impression that the computer will demand new, simplified, and arbitrary rules for arranging data. And indeed many so-called computer experts will not make a serious effort to devise ways to achieve traditional results. They are likely to approach the customer with a sense of superiority which often cloaks their uneasiness

about their lack of knowledge of the specialty in question. On the other hand, the traditional indexers and reference workers—the information handlers—once they learn a smattering of knowledge about computers, may embrace the new discipline so eagerly that they will willingly throw to the winds many of the conventions which they once prized so highly. In point of fact, very few compromises are necessary with traditional methods if imagination is applied to the problem.

Since many of the typical sequencing operations are bibliographical in character, readers may wish to study the recommendations of Theodore C. Hines and Jessica L. Harris.[6] The Hines-Harris code, in the judgment of this present writer, makes unnecessary compromises with the established and valid techniques of library sequencing in the interest of accommodating to the "demands" of the computer, and therefore indicates some deficiency in insight and imagination, but at least the problems are clearly defined.

Some indication of the complexity of such sequencing may be grasped by a careful examination of the following selection of items, suggested in part by the Hines-Harris book and in part by other similar listings:

ART—FRANCE
ART—HISTORY
Art, American
ART AND MORALS
L'Art Modern
Bible. Old Testament.
Bible. New Testament.
Charles I, king of Great Britain.
Charles I, duke of Lorraine.
Charles II
Defoe, Daniel
De Gaulle, Charles
De la Roche, Mazo
Demetrius
McDonald, Malcolm
MacIntyre, Duncan
M'Laren, J. T.
New York University
Newark, N. J.
Newark, N. C.
Nîmes
1914
Old man of the mountain

[6] *Computer Filing of Index, Bibliographic, and Catalog Entries.* Bro-Dart Foundation, Newark, New Jersey, 1966.

101 famous poems
Saint George
St. Malo
Saint Nicholas

This arbitrary selection of items raises such questions as the letter-by-letter versus the word-by-word approach, how to handle roman numerals, punctuation, numbers, "Mcs and Macs," and other similar problems. It is obvious that sequencing is a highly specialized field of knowledge representing a substantial body of conventions developed over the years.

The cumulation of data. A variation of the sequencing application makes possible the preparation of cumulated lists. For example, an index to a loose-leaf tax or labor relations service will contain citations for a given week or month. The next index will present citations for two issues, and so on with the third, fourth and fifth. Or perhaps the cumulation will take place only at intervals. Three monthly supplements might be issued before the cumulation takes place. Once a year the past year's cumulated citations might be merged with all that had been accumulated before. But for each issue there will be a typesetting application and although the old entries will have to be reprocessed through the phototypesetting unit the cost is usually substantially less than the manual collation of hot metal slugs.

Redundancy elimination. In the cumulations of this sort it may be necessary to add to a sophisticated sorting or sequencing program one which also eliminates so-called redundancies. For example, a labor relations index for a given month might contain the entry:

Fair Labor Standards Act
—definition of interstate commerce under, III, 42

In the next month's supplement an entry might read:

Fair Labor Standards Act
—standards for employment of women, IV, 426

The third month the entries would be merged, new ones added, and redundancies eliminated, as follows:

Fair Labor Standards Act
—child labor, V, 765
—definition of interstate commerce under, III, 42; V, 763
—standards for employment of women, IV, 426; V, 766

It is obvious that special programs are required to accomplish this result. If the programming is to be created by the publisher he will need to take into account not only customary data processing information but he will also have to make sure that his input includes and can accommodate appropriate

typesetting codes, such as for upper and lower case characters, and that the presence of these codes does not interfere with the computer's pre-typesetting manipulation.

There is a tremendous desire for programs which sort, cumulate, eliminate redundancies, and typeset, but the desire is based upon the utility of the end product and not necessarily upon ability to pay. Cumulations are expensive because the file becomes larger and ever larger. It is an ideal typesetting application since the assignment continues on and on and gets bigger and bigger. But it is not used as widely, as yet, as it should be, because of the costs involved. Where special funds are available, in the field of medicine, health and atomic energy, such lists and cumulations thereof are proceeding rapidly. In other areas, such as for union library catalogs, cost has been a deterrent.[7]

Redundancy elimination is very difficult to program in any generalized sense because the *levels* of headings vary. The general rule would be to drop every heading level except that which is unique to a particular entry or group of entries, and to cumulate all references on the same line, changing punctuation where required. In some cases, therefore, editing procedures are coupled with cumulations to provide the most compact and intelligible results.

The Explosion of Data. The term "explosion" is applied to the production of multiple lists from a common entry. Heretofore, however, each separate listing was an entry in its own right. With the advent of computers the various elements that comprise an entry can be manipulated to provide alternative presentations of the same item.

Consider, for example, a book catalog, such as a publisher's list of his books in print, or a library's classification of its holdings. Here are the possible permutations and combinations of a single published work, all of which combinations have been keyboarded in the past as distinct entries after a prior sequencing, usually by hand:

Bronson, Bertrand Harris, 1902— comp.
Catches and glees of the eighteenth century, selected by B. H. Bronson and L. M. Alcott from the Apollonian harmony (ca. 1790) 2nd printing, rev. Berkeley, University of California Press, 1955 (Folksong series). 1. Glees, catches, rounds, etc.—To 1800. 2. Folk songs (British)—18th century. I. Alcott, Louis Marshall, 1907— , jt. auth.

784.1
B

[7] See commentary by Richard Goodwin, Chester County Library, in article entitled, *Report No. 14, Mechanized Procedures of Rocappi,* The LARC Report (Library Automation Research and Consulting), Volume 1, Issue 2, Denver, Colorado, 1968.

By Dewey number:

784.1
B

Bronson, Bertrand Harris
Catches and glees of the eighteenth century.

By author:

Bronson, Bertrand Harris
Catches and glees of the eighteenth century.

By subject:

Glees, catches, rounds, etc.—To 1800
Bronson, Bertrand Harris
Catches and glees of the eighteenth century.

By joint author:

Alcott, Louis Marshall, 1907— , jt. auth.
Catches and glees of the eighteenth century, selected by B. H. Bronson and L. M. Alcott from the Apollonian harmony (ca. 1790) 2nd printing, rev. Berkeley, University of California Press, 1955.

By series:

Folk Song Series (University of California Press)
Bronson, Bertrand Harris
Catches and glees of the eighteenth century.

By title:

Catches and glees of the eighteenth century, by B. H. Bronson and L. M. Alcott.

Obviously there are still other ways in which this same entry could be listed. Catalogs are now fairly extensively produced which involve this type of manipulation, including or excluding certain aspects of the entry from certain of the listings, varying the measure, size of type, type face and format for each category of listing, if desired.

The entries which are to be exploded need not be input by the computer typesetting center. This may be an appropriate area for customer participation, especially where the generation of the initial input information can be derived from the preparation of a library card, from the placing of a purchase order, or from the inventory records of the publication house. In libraries, the same data or part of it might be used in connection with the computer processing of library circulation (charge-out) data. Ultimately,

publishers may supply such input as may be required, for the books they distribute, in machine-readable form.

We have selected book catalogs as an illustration of "explosion" although this particular application is rather complex. It is, however, a field in which the potential market—if economical systems can be developed—is vast. Individual libraries are combining into systems which are city-wide, county-wide or state-wide. Cataloging and ordering procedures are being standardized. Inter-library loans are encouraged. EDUCOM, for example, has been set up with government and foundation support to encourage the sharing of facilities and information by universities. Common catalogs and listings of data are urgently required. To maintain card files in each library is expensive, necessitating many cards and much filing. A printed catalog can be provided not only for each participating library, but copies can be made available to school classrooms and to researchers. It is possible to take home for private study a listing of the entire collection of a medium-sized library.

Another "explosion" application is the production of an industrial directory or product guide. Typically this consists of the repetitive listing of firm names and addresses under each of the products which the firm manufactures or distributes. A manufacturer of hardware items might be listed in the annual buying guide of *Hardware Age* (a Chilton publication) under as many as a hundred or more products, such as Screws, Wood; Screws, Machine; Screws, Metal (Aluminum); Bolts, Hexagonal; Hammers (Ball & Claw), and so forth. A change in name or address, the addition of zip code information, or a new telephone exchange, would formerly have required the revision of many lines of composition. With only one basic entry the change needs to be made only once, in the master file, and it will appear consistently in each and every listing. Last minute notations can be made—usually to indicate in bold face or by special typographic symbol the firms which are advertisers—and even the page on which the advertisement may be found. Special brand names can also be listed which are associated uniquely with a particular product.

Important as these advantages are, the ability to produce a mailing list or to generate a questionnaire by computer printout for the purpose of verifying the entries in the master file adds to the convenience and to the value of the system.

The number of product guides published yearly is extremely large and is constantly growing. McGraw-Hill publishes a *Guide to American Directories* which lists many of them, but does not reveal the volume of composition which they represent. It has been estimated that there are presently more than a million pages of such material published annually, comprising perhaps 300,000,000 lines of composition. This estimate was given to the author by a former product manager at McGraw-Hill who had been engaged in this field for many years.

The "explosion" treatment is also applicable to listings of members of professional societies and fraternal organizations, whose names might be arranged alphabetically, geographically, by fields of major interest or endeavor, by company, academic affiliation, etc., and of course the same approach is useful for the production of college alumni directories which customarily include alphabetic, geographical and class sections.

Bibliographical data can also be handled in this manner. Abstracts, titles of papers, names of authors, and other relevant information can be listed in several ways, including arrangement by key words.

Catalogs for dog shows have been produced in the same manner, since the initial listing is by breed and class of entry, but a supplementary listing by owner is usually provided.

The more variants there are for a given entry, the more economical the application.

Updating. Text books are no longer capable of withstanding competition for more than a year or so. In certain fields even an annual revision may be required in order to keep abreast of the subject. The same can be true of encyclopedias, almanacs, fact books, reference tables and bibliographies. Dictionaries, Who's Who and other compendia of biographical data, lists of medical symptoms, proprietary drugs, prices of automobile parts, surplus materials available for sale, new record releases and the like are but a few of the many applications that come to mind. In all of these cases it will be more advantageous to reset the entire publication from a revised magnetic tape than to make manual changes in standing type. Whether the new convenience in updating and revising will also portend a trend toward shorter print runs and more frequent editions one can only speculate about at this point.

Selective Extracting. It is possible to produce a comprehensive work and, at the time of its initial keyboarding, code it in such a fashion that sections may be extracted for abridgment. A universal dictionary can spawn a college or high-school version. A thesaurus of words or phrases can be abbreviated or culled over for selective marketing.

One such example, which has been produced in this manner since 1966 is *The American Bar,* published in Minneapolis by Reginald Bishop Forster. A two-volume and an abridged one-volume edition are both composed from the same master file. An article in *The New York Times* (February 26, 1969) describes the release of a ten volume publication entitled *The Annals of the Encyclopaedia Britannica,* consisting of historic source documents, set by Videocomp, from which it is intended to produce special products. A travel guide for Pan-American Airlines contains travel events occurring in many countries. More particularized collections of information (e.g., events in Scandinavia) can be obtained.

Calculating. Occasionally a large typesetting job arises in which virtually no input needs to be keyboarded since the initial material may be derived by computation. This would be true, for example, of a table of logarithmic values or of sines, cosines and tangents. A publication for the American Society of Testing Materials, a *Viscosity Index,* was produced in this manner in 1965. Only one column of figures on each page was keyboarded. All other columns were calculated.

Reformatting. As suggested earlier, there will be many instances in which material may be reset to a different format and in a different type face without any change in the contents of the book itself. The King James Version of the Holy Bible has been stored for The National Bible Press so that many different editions may be produced, with or without footnotes and center-column annotations. A *New Testament* has already been typeset from this file and other projects are pending.

Several versions of the same drug catalog have been produced in a variety of typographical formats for the pharmaceutical firm of Smith Kline & French.

The Development of the Data Base. In many of the cases we have described, and in virtually all of the applications which will be subsequently described, a *data base* is created. It is from this file that material can be extracted, exploded, abridged, reformatted and resequenced. As we shall see, the file may also be utilized for *search and retrieval.* Publishers are avidly seeking such data bases at the present time, whether in the form of a dictionary, a catalog of books or bibliographical data, a listing of products or producers, or an anthology or poetry and prose. Many publishers already have the raw material for such a file, although it may not yet be in machine-readable form. Some who are the wealthy possessors of such data simply are not aware of the value of the information in their possession and the many and profitable uses to which it may be put. Those who publish statutes, regulations and tariffs are in this category. Even the newspaper, where the data base is history-in-the-making, finds that it now possesses a new and exploitable commodity. *The New York Times,* for example, has already begun to address itself to the task of creating and maintaining such files, useful not only to itself as a *morgue,* but to scholars and researchers everywhere. Its computerization of its *Index* is only the first step. It has already announced the republication of its Sunday *Book Review* from its inception, fifty years ago, and it intends to index these volumes in considerable depth. In order to facilitate its task of information classification it has developed a computerized *Thesaurus of Descriptors* which it offers for sale and promotes in the interest of greater uniformity of classification.

The *Times* has now (March 27, 1969) announced plans for a "computerized service that will for the first time permit outsiders, as well as company

employees, to have access to materials in the newspaper's information files. Dr. John Rothman, director of information services for the *Times,* said the bank would be the nation's first fully automated general information system".

Computer-created Markets. On the whole we have been discussing existing markets that may be successfully invaded with considerable advantage by computerized composition techniques. These range from the one-time setting of periodicals and books to the production of indexes, product guides, encyclopedias and dictionaries. The new computer techniques will make substantial inroads into these areas, but most people believe that the most existing and profitable applications are to be found in the typesetting of computer-generated data—a market which heretofore had never existed.

All of us are familiar with the use of the computer printout as a means of conveying information. Perhaps four to six legible copies of such a printout may be processed at one time. A second run for the mere purpose of producing another four to six copies would normally be extravagant.

It is possible to mount multilith paper plate stock directly on the computer printer and thus obtain offset printing plates for poor quality, short-run printing where more than a half dozen copies is required, and new Xerox-type processors will replicate and sort the printouts themselves, but the most common solution is to photograph the printout, which is usually reduced in size so that the page is more manageable and is still reasonably legible. Often the printouts are manually assembled into tighter columns and smaller pages. Rules are scribed and headings are inserted. Offset plates are then made and the desired number of copies is printed and bound. In view of the many shortcomings to this technique, in addition to obvious esthetic drawbacks, two other methods are finding increasing popularity. One is the use of an on-line microfilm printer such as that produced by Stromberg-Carlson; the other is high-speed photocomposition from computer-generated data.

It was the existence of this large volume of computer-produced data which led the United States Government Printing Office to let the contract for the development of the first high-speed composition device. Winner of the award was Mergenthaler, which was assisted by CBS in the area of photo-electronic technology. The Linotron 1010 was developed and became operational in 1967. Two such machines are now used daily by the GPO, three have been or are about to be installed in other government agencies (Air Force and CIA) and one commercial plant has been opened in New York City (Automatech). The competition for the GPO contract provided impetus for further research by other manufacturers or would-be manufacturers. In point of fact, the first truly high-speed device was the Photon "Zip," or 901, in use since 1966 at the National Medical Library for the *Medlars* project. A second 901 was installed by General Motors for the pro-

duction of parts and price lists, and a third, in New York City, was offered for use to the "trade" by Sedgwick Printout Systems. The 901 is a photomechanical device rather than an electronic typesetter, but in some applications it achieves speeds of a comparable order of magnitude. Prior to Sedgwick's installation, access to a "Zip" in London, England, was available to customers of International Computaprint. (Latham Process Corp. in New York has installed a "Zip" more recently.)

The economic advantages of photocomposition of computer-produced data are well summarized in a study produced for the Joint Committee on Printing by the GPO Departmental Electronic Printing Committee. It is entitled, *Electronic Composing System: a guide for its utilization,* and is available for sale by the Superintendent of Documents. (Ref. No. 1966-0-797-612). A few quotations from this report may prove helpful:

> With the advent of electronic data processing in the early 1950's, increasing amounts of composition are being produced on this type of equipment. It has been reliably estimated that today close to 20 percent of all Government printing is composed in part or in whole on EDP equipment.

But the report points out that the reproduction of line printer output involves:

- some sacrifice in quality and readability
- increased bulk
- increased printing and binding costs
- loss of some of the potential of the computers themselves—because even line printers are slow in comparison with the internal speed of the computer.

An electronic composing system offers improved quality and readability, a substantial reduction in bulk, avoids the increase in printing and binding costs and makes it possible for computers to operate more efficiently. "Savings as great as 40 percent are obtained by application of the system. As an example, 20,000 copies of an 800 page computer printout job would cost $11,305 more to print and bind than it would if it made only 480 pages—a reduction of 40 percent in number of pages. A 100-page computer printout job, printing 1,000 copies, could be printed for $165 less if reduced by 40 percent, to 60 pages."

In other words, as the report points out, "the larger the reduction of the job in total number of printed pages and the greater the quantity of printed copies, the higher will be the saving to offset the programming cost." The report points to "supply manuals, stock lists, parts catalogs, directories, indexes, abstracts, repetitive tabular material, and text that is fed to a com-

uter to update a master file," as the most likely sources of work for the new system.

Other advantages cited include substantially increased speeds of production and reduction in bulk, bringing about savings in costs of distribution (mailing and shipping, floor space and material handling).

Samples of pages produced on computer printout, showing how they would look when set in type, are well worth studying. The stock control data section of an Air Force stock list, the manufacturer's Federal code index section of a stock list, and two abstracts (*Index Medicus* and the Department of Defense's *Technical Abstract Bulletin*) are shown in this government report.

The installation of the Linotron 1010 equipment more than justified the Government's expectations. Dramatic savings in paper, printing and distribution costs have been realized which will pay for the cost of the equipment in only a few years. In the year 1968 over 800 tons of paper were saved and more than a million dollars in printing and binding costs.[8] Savings would have been much greater if it had been possible to use the equipment more intensively. The major deterrent has been the lag occasioned by the need to program in order to provide the necessary "Edit-Insert" format statements for the GPO typesetting software. At the present time the Government Printing Office charges its customers (the other government agencies) as if it were using the typesetting devices intensively. Since this is not yet the case there is an element of cost which is charged against the overhead of the entire GPO operation, but this is expected to disappear in a matter of another year or so.

What is true for the United States Government must be true for industrial applications as well. A more attractive format can be provided, with enhanced legibility, with substantial savings in paper and printing costs, wherever the number of pages and/or the length of the press run is high. The savings in space occurs not only because type is proportional and hence more characters can be fitted onto a line, but also because it is possible to deviate from computer print formats. Tabular formats are necessary to distinguish between portions of an entry. When distinctions can be provided by the use of bold and italic type, these elements can be "run-in," and a great deal of white space can be eliminated. Consider the following example:

A hypothetical example of a computer printout of bibliographic material, set in tabular format, in contrast to a "run-in" setting of the same data in conventional type, using bold, italics and roman faces to achieve differentiation between the elements may be found to be of considerable interest to those who believe in the "economy" of the computer printout.

[8] Remarks by John J. Boyle, at the I.E.E.E. meeting at the Washington Hilton, February 25, 1969.

CHEN, LUNG-CHU ST. MARTIN, 1967	FORMOSA, CHINA AND THE UNITED NATIONS 428P
CHERNIAVSKY, MICHAEL PRENTICE, 1967	PROLOGUE TO REVOLUTION 249P
CHESHIRE, DAVID F ARCHON, 1967	THEATRE: HISTORY, CRITICISM AND REFERENCE 131P
CHESS, VICTORIA MEREDITH, 1967	FLETCHER AND ZENOBIA IL
CHESTER, MICHAEL NORTON, 1967	RELATIVITY; AN INTRODUCTION FOR YOUNG READERS 158 P IL
CHESTERTON, GILBERT KEITH DODD, 1932	COLLECTED POEMS 391P
CHICHESTER, FRANCIS CHARLES, SIR COWARD, 1968	GYPSY MOTH CIRCLES THE WORLD 269P IL

CHEN, Lung-Chu, *Formosa, China and the United Nations.* St. Martin, 1967. 429p

CHERNIAVSKY, Michael, *Prologue to revolution.* Prentice, 1967. 249p

CHESHIRE, David F., *Theatre: history, criticism and reference.* Archon, 1967. 131p

CHESS, Victoria, *Fletcher and Zenobia.* Meredith, 1967. il

CHESTERTON, Gilbert Keith, *Collected poems.* Dodd, 1932. 391p

CHICHESTER, Francis Charles, Sir, *Gypsy Moth circles the world.* Coward, 1968. 269p il

In other words, italics and bold face, along with roman, with a run-in format, provide a more legible and satisfying appearance and require less space. When proportionality is considered, too, the saving is of course much greater. Finally, it is possible to set proportionally-spaced information, clearly and sharply generated, in smaller point sizes.

To some extent the development of upper and lower case chain printers has deterred the transition to high speed phototypography. But such print-

ers, while they can offer a more legible product, still cannot provide emphasis and must therefore require contrived and space-consuming formats. Moreover, printers of this variety are considerably slower in terms of the amount of computer time they require.[9]

The new CRT devices offer much greater adaptability. In one application that the author is familiar with it was found possible to go from six columns of data on a page to ten columns, also avoiding the photo-reduction that had previously been found necessary. The final product will be set in *four points all caps, three and one-half set, on a 3.9 line "leading."*[10]

A year ago our forecast of the volume of business to be derived from the conversion of data files would have been somewhat more bullish than it is today. Let us examine projections as to possible volume and then consider the competitive elements that are now beginning to be brought into play.

How would one go about preparing an estimate of the volume of such composition? Many have wrestled with this problem in ways which are somewhat less than definitive. Projections which we have seen, and which we have developed ourselves, are arbitrary, but nevertheless interesting. They are based upon the following line of reasoning:

At this point of time there are approximately 45,000 computers in use in the United States. Assume that one-half of these computers have on-line printers. Suppose the average speed of such printers is 600 lines per minute, and that they are in operation four hours out of each twenty-four. They would thus turn out 3,240,000,000 lines of printout per day. If there was a typesetting by-product *which involved only one percent* of this output, this would nevertheless amount to 32,400,000 lines of composition each day. If each line contained only 30 characters the daily available output would be 972 million keystrokes or 486 million ems of composition, roughly equivalent to 1350 full-length novels per day.

[9] A "chain" printer with two upper case and three lower case alphabets would operate at three-fifths the speed of an all upper-case printer. A more extended character set would further reduce output speeds. It may be of interest to know, however, that the Clearinghouse for Federal Scientific and Technical Information, which is part of the National Bureau of Standards, has installed an IBM 1403 Printer modified for wide print hammers and half-line spacing. An extended print train was ordered containing 188 distinct characters. The character set includes a number of special characters "enabling one to generate chemical structures and stylized mathematical formulas on a line printer." However, the NBS plans to use this printer not for final output but as a galley proofing device in their computerized phototypesetting system. (*Installations and Applications,* Composition Information Services, January 1969.)

[10] As mentioned earlier, on certain CRT typesetting devices it is possible to vary the width of the character in relation to its height. Hence a character can be set as if in a 3.5 point type face so far as width is concerned, as four point type face so far as height is concerned, and a 3.4 point type face so far as distance between base lines of type is concerned. Since in this case the information to be set was in an existing all-cap file one did not need to consider problems of line spacing due to the existence of descenders. The customer had been positive that because of the tabular nature of the listings, no savings whatever could be accomplished.

The reader may well say that any such result would be fantastic. If he wishes to base his calculations on more conservative assumptions let him also take into account the projection of not 45,000 but 70,000 computers in use within the next several years.

But one reason why it is difficult to make projections is that extrapolation from present trends may not be warranted in view of new technological possibilities. Suppose one were to forecast, for example, that "publication" will increasingly take the form of the accumulation of information in data banks, to be produced on demand in unique reader-oriented packages. Would this mean more composition or less? Fewer books and articles might be produced (writers somehow being motivated to create principally for the purpose of enhancing the store of the data bank), but there might be a great deal more typesetting of special reports and compilations. Would these reports be generated on expensive high-speed CRT devices or would they be created by a cruder representation on a TV-type console and a Xerox-like reproduction of the page image?

All that we can be certain of at this point is that the trend toward CRT typesetting of computer-produced data is increasing very rapidly at the moment and will probably continue to do so for some time. Until more generalized format programs are available, however, the difficulty of converting the file into the condition required for typesetting will continue to impose limitations in terms of time and cost. These conversion (or "edit-insert") programs must be reasonably efficient or the possible economic advantages of typesetting may be cancelled. For example, assume a given job now takes 100 hours to format for the on-line printer and to print. If the "format for typesetting" pass takes the same amount of time (and a poorly-conceived program could take much, much longer) then there is obviously less inducement to make the change to type than would be the case if savings in printing and binding were also accompanied by savings in computer processing time. (No statistics are available, so far as we know, to indicate whether the use of the Linotron 1010 in government offices has increased or decreased the amount of computer time required, or what the cost of such time would be.)

At this point many of those who have moved from printout to type have been so overawed by the glamor of the process that they have often not looked very critically at the price they have been obliged to pay in terms of computer and typesetting time. Certain of the products now being produced, on certain of the typesetting devices, have been so poorly conceived that the ratio of computer time to typesetting time is seriously out of balance. This is in part due to the selection of type faces requiring frequent font loadings, or to the page formatting requirements. Competition has found expression in a "per-line" charge for setting "across-the-page," but less attention has been paid to the demands upon the customer's computer and his programming staff. It is possible, therefore, that some degree of disenchantment may set in,

but the shortcomings of program and conception are quite capable of being remedied once the problem is clearly identified.

Suppose, however, that the CRT typesetter becomes a mere computer peripheral? In this event, while the quantity of such typesetting could be nothing less than fantastic, there could be no *market* for the service in a conventional sense. There would be no need for computer typesetting service centers or for printers catering to this specialty. The 972 million keystrokes of composition produced daily would disappear from the market and only the smaller and more conventional uses would remain. But they, too, would be swiftly taken over if, as we believe to be the case, there will shortly cease to be a valid distinction between typesetting from a pre-existing data base and from one newly created for typesetting purposes.

Perhaps this is the way events will ultimately develop. IBM, in laying its marketing plans for the 2680, the Alphanumeric CRT device which they have incorporated into their showcase, projects it, apparently, as just another peripheral device which offers more flexibility than the conventional on-line printer. True, it is an expensive piece of equipment to be obliged to remain idle while the computer is busy doing other things, but this is not much less true of other peripherals. And if a 2680 can be offered for sale or lease today in the price range of a third of a million dollars or less, who knows what tomorrow may bring?

So what will happen if type can be created so casually and in such quantity? Much of the composition industry might cease to exist, and printers might become merely trade pressrooms.

But even the printing process may be revolutionized. Short-run printing may take the place of longer runs on big and expensive presses and the printing industry as we know it today would be simply an adjunct to the data processing department.

And so it appears today that there are conflicting tendencies in the air: those that suggest larger-scale production and concentration of facilities and capabilities in fewer hands—and those that imply diffusion, widespread access, and proliferation.

There are grounds for a moderation of enthusiasm and for the injection of a cautionary note in what might otherwise be extravagant forecasts of things to come for the alert typesetting center, but as we have already suggested, we believe that the market over the next decade will be an exploding one and that some portion of this—perhaps still the major portion—will be attributable to the possibility of capturing certain existing computer files. Only the microfilm alternative needs to be watched carefully. The résumé in *Graphic Communications Weekly* tells this story:

> MICROFILM TO PRINT PROCESS FORESEEN. Active interest in microfilming, by both users and manufacturer, is seen by Barrons, the finan-

cial weekly publication, which surveys the field in a recent issue. In one specific area, microfilm service bureaus, the manufacturer and user is the same, with companies like IBM getting into the microfilm service center business.

This interest by IBM and other computer manufacturers may lie in the potential market for computer-output-microfilm (COM) systems, but Barrons learned that this is not the sole activity of service centers. From there, it seems, such organizations could get into printing—" a low-cost, high-resolution master offset print can be made directly from microfilm," says the publication. Another service: computer micrographics, aimed primarily at the production of engineering blueprints.

The story in Barrons, concerned with the companies in this field and with the current and foreseeable market, notes that in ten years conventional microfilming will account for only 15% of the market. About a fourth of expenditures at that time will go for film and other supplies, and an additional 15% for services. That leaves 45%, which will be for systems relating the computer to microfilm.

"To listen to the enthusiasts, there's no end to what lies beyond that," reports the weekly. "The entire Encyclopaedia Britannica on a card file? Yes, says Information International Inc.'s George Harmon. A public library system that doesn't loan books but instead hands out pieces of microfilm? Easy, Mr. Harmon says. Costs of the film wouldn't be more than a cent, which would be dramatically less than what it costs to buy, handle and store books. New homes with a built-in microfilm library? Why not, asks Mr. Harmon. It would occupy about the same space as a phonograph."

Pointing out that this is not blue-sky stuff, they note that Encyclopaedia Britannica has announced its intention to publish a series of resource libraries on ultra microfiche.[11]

Some of the applications described in the above article relate to new products not presently on a data file, and in this respect we may look to microfilm to compete not only for the market now represented by computer printouts, but also for some part of the market now fulfilled by conventional book production.

The microfilm printer will compete with the CRT typesetter. However, the CRT also has, or will have, the capability of producing a microfilm image. This is already a feature of the Videocomp. But because the CRT is a more versatile machine its product is more expensive, and in this microfilm market it may not be entirely competitive.

Specific Examples of Computer-Created Markets. How typesetting relates to the generation of data may be illustrated by the following purely hypothetical examples.

[11] Graphic Communications Weekly, February 25, 1969, page 11. Published by Composition Information Services, Inc., Los Angeles, California.

1. A wholesale distributor creates a system whereby he obtains complete control over inventory. He can calculate its value by LIFO and FIFO methods. When supplies are low new orders of appropriate items are automatically generated, the location of new merchandise is registered, sales commissions are calculated on items that are successfully moved, customers are billed, turnover statistics for different products are generated. Such a system is obviously invaluable in its own right. The fact that it could also supply the data to produce a catalog (or a series of catalogs with different prices based on different markets) is merely an added advantage, but such could indeed be obtained, and in highly attractive format.

2. A life insurance company is engaged in research in the computation of claims for different categories of risk. Based upon its own experience it generates rate tables. These may be subject to constant revision. They need to be made available to salesmen. The policies themselves, containing unique features, need to be typeset. Booklets describing benefits need to be created for group distribution and certificates of coverage must be issued.

3. An airline, train or bus company computerizes its schedules in order to keep track of interrelationships at connecting points. It also establishes a nationwide or world-wide reservation system. Total systems' schedules and selected portions thereof can be published in typeset form.

4. A wholesaler develops a system to calculate selling prices for different grades and quantities of a diversity of products, each with its own markup. He is obliged to publish a catalog for the benefit of his customers who must look up his prices in order to compute their own raw material costs in submitting bids to their customers. A case in point would be a catalog of printing paper prices.

5. A distributor (books or records) wishes to make available to his customers, from his inventory records, a list of items currently in stock. He may wish to present these in different ways—perhaps a list of items for special sale (that have been found to be slow-moving), perhaps a listing of timely materials (seasonal or related to a particular event such as an author's or composer's birthday).

6. A trade publisher calculates and then publishes tables showing

trade-in values for automobiles, cost of standard repairs, or specifications for component elements.

7. A publisher of a racing newspaper might keep track of race results, handicaps, breeding data, weight of jockeys, track conditions, etc., not only for purposes of diagnosis and analysis but to present in compilations for the scrutiny of flat-racing aficionados.

8. A telephone company updates its billing file with a list of new subscribers and phone changes. These data provide the input for the daily addenda and for the directories themselves.

9. A national fraternal organization maintains a list of its members in order to produce address labels for its monthly magazine. It decides to publish a geographical directory based on the same data.

10. A university computerizes its alumni files in order to solicit funds for the "annual giving" campaign. It uses the same data for a directory of living alumni.

11. A college computerizes its class offerings as an aid in scheduling. It decides it can use the same data as a basis for the course offerings in the printed catalog.

12. A library adopts a computerized order system and generates as a by-product a catalog of new acquisitions.

13. A market research organization maintains a list of company names, addresses, products and officers. It decides to produce a directory containing this or selected information.

14. A nationwide credit-rating company maintains its files by computer and continually updates its credit information. It also publishes demand reports to its subscribing members, and to all subscribers sends a periodic digest of trends.

The Computer as an Aid to Scholarship. Students of languages and literature have found that it is possible to use computer search and sequencing techniques in order to analyze word usage and style. Similarities and differences may be observed from one work to another and from one author to another. Phrases are grouped about key words, and these phrases are reproduced with appropriate source identifiers. An example of a form of this type of scholarship will be found in the appendix, from a concordance of the works of Livy. Although not every word is chosen for analysis, only the most common terms are left out, and so voluminous treatment is required. One

such work consists of four volumes of 600 to 800 pages each, in six point type, representing more than 20 million keystrokes.

The Permuted Index. Often computer techniques are employed as a means of classifying information, as an alternative to conventional indexing techniques. The permuted index is such an approach, but it is useful only if the title or sub-title of the article in question is reasonably descriptive. For example, if the title of the work in question is "The Market for Computerized Composition," the permutations could be:

Market for Computerized Composition
Computerized Composition, Market for
Composition, Market for Computerized

These terms would then be sorted along with many others to produce a master index.

The Kwic Index. This is an acronym for *Key Word in Context.* A search is made for a key word or description, usually in text material, or in abstracts of text, and an arbitrary number of characters or words on each side of the key word is reproduced so that the reader can determine whether the term, as used in the particular article, is germane to the subject under investigation. Such lists are often quite exhaustive. They make up in quantity what they lack in quality; that is, in the substitution of so-called automatic indexing for the application of more conventional systems of classification.

Following is an example of a computer printout of a KWIC index:

```
ROFOUND STUDY OF PHYSICAL AND PSYCHOLOGICAL ACTIVITY IN THE SOCIAL SET  42784
IN THIS PROFOUND AND DETAILED PSYCHOLOGICAL ANALYSIS OF CONTEMPORARY P  49876
L THEREFORE FIRST ESTABLISH A PSYCHOLOGICAL BASIS FOR INTERROGATION AN  37529
HOWEVER, WE MUST CONSIDER THE PSYCHOLOGICAL PROBLEMS OF MODERN WARFARE  42579
LIEVE THAT IN TODAY'S SOCIETY PSYCHOLOGICAL WARFARE HAS SUPPLANTED CON  67890
. AMONG THE MODERN GENERATION PSYCHOLOGY AND SOCIOLOGY ARE SUBJECTS TH  12478
 IN MAKING AN ANALYSIS OF THE PSYCHOLOGY OF TODAY'S YOUNG PEOPLE IS TO  49801
 FOR SOCIAL COMMENTARY ON THE PSYCHOLOGY OR SOCIO-PSYCHOLOGY OF REFORM  57862
```

While computer printouts can be reproduced for this purpose, type saves space and provides the opportunity for variety and emphasis.

Obviously there will be increasing use of computers for scholarship, whether literary, statistical or scientific. Our universities and research centers have perhaps the heaviest investment in computer hardware next to government. The findings developed out of this research will need to be shared and preferably set in an attractive typographic manner. This is an application which would involve no keyboarding for typesetting, and which represents a considerable volume of typesetting to be derived from a relatively small base of data.

One development which would substantially enhance the value of the computer in this area of scholarship would be the capability of representing a larger character set than that conventionally processed on an on-line

printer. Conventions need to be developed for representing a character set of virtually an infinite capability. When this is accomplished it will of course be imperative to use phototypesetting by CRT device in order to provide the graphic symbiology which is appropriate for scientific and scholarly work. No computer printer, even of the chain variety, with the possibility of five "alphabets" would meet the needs for character representation.[12]

General Categories of Computer-Produced Printouts. Following is a list of classes of work now being produced for industry on computer printer and distributed in printed form by photo-offset. In some cases printout pages are reproduced in exact form, perhaps with captions stripped by hand; in others, extensive paste-up takes place in an effort to conserve space and make the format more useful. But in some cases, as in the instance of the *Official Airlines Guide,* now being typeset by R. R. Donnelley on the Videocomp 830, the example set by the United States Government in moving away from printout to composition has already occurred. This is also true of some of the large price and parts list applications, such as those produced on the Photon 901 by the General Motors Photos Products Laboratory.

Airlines timetables and schedules
Railroad and bus timetables and schedules
Insurance actuarial tables
Tariff charges for classes of merchandise from point to point
Parts and price lists
Listings of books in print
Abstracts of scientific, etc., articles
Bibliographical data
Tables of physical or chemical properties
Mailing lists and directories
Credit rating information
Voters lists
Car registration information
Market studies
Financial and statistical analyses
Lists of securities
Lists of movies, records, visual aids, etc.
Hotels, restaurants, stores, etc., cooperating with credit card charge-it systems
Biographical information
Medical symptoms and related diseases

[12] See Seybold, John W., *Typographic Conventions for Computer-Related Transfer,* presented at the American University Institute on "Management of Technological Change in Printing and Publishing," held in Washington, D.C., January 15-17, 1968. Reproduced in a collection of papers by Composition Information Services, Los Angeles, California, under the name of the institute.

Drugs and contraindications
New patents

The reader will readily recognize that already many of these applications have been exploited. Bowker has computerized its *Books in Print.* There are many phototypeset compilations of abstracts. Standard & Poor's Corporation is developing a security listing identification reporting system for the American Bankers Association, called CUSIP (Committee on Uniform Standard Identification Procedures). The American Medical Association is developing a computer analysis of symptoms and diseases. An alumni directory for Cornell University was produced several years ago, and many other similar projects have since been carried forward. One of the earliest of such applications was the typesetting of the membership directory of the American Medical Association by Datagraphics. Reference to Appendix IV will be helpful, since it illustrates many such applications.

The Mass Production of Information. It seems probable that of all of the uses the most impressive and extensive will be in connection with the proliferation of information useful for research purposes. Rather than to term the manipulation of such data an "explosion," the term *implosion* is sometimes used because it implies an increasingly minute categorization and proliferation of data. The reader is no doubt familiar with the *Index Medicus* which summarizes published research findings in the medical field, the high-speed typesetting of which attracted so much attention several years ago. A chemical abstract, a nuclear science abstract, a similar one for the biological sciences, and a summary of patents issued are others that come to mind. It is a huge task to read, digest, abstract and index material of this character and to some degree these tasks, judgmental as they are, may be automated. But however the data may be collated, it must be kept current. Perhaps not all of these cumulative summaries will be published. Selected lists may be reproduced on demand, but the odds are that comprehensive publications will continue to be a major and significant undertaking—increasingly for worldwide distribution—and that these listings will be both comprehensive and current, minimizing the number of documents that must be searched to get a complete listing of all that has been assembled or compiled on a given subject. This is the field of *documentation.* One illustration of how extensively it can be carried forward is the activity of the *Institute for Scientific Information.* This company publishes some 23,000 tightly-packed pages of scientific citations yearly and the rate of increase in the data collected is steady. Other similar ventures, both public and private, are developing constantly. Universities themselves play an increasing role in the accumulation and analysis of specialized areas of knowledge. "Knowledge" or "information" centers are projected and are in the process of establishment as repositories or custodians of scientific (and perhaps business) data. The organization or institu-

tion in possession of the "data bank" for a given field may indeed be in a key position. A list of some of the existing information centers will be found in Appendix II.

Information Retrieval. Anyone who finds data he is looking for has *retrieved* information, but the term generally implies systematic classification and ready, usually on-line, response to a demand for selected facts of specific interest to the inquirer. It is, of course, not essential to have a computerized system in order to classify and retrieve information. A reference book performs this function. So does a card catalog or a set of edge-notched cards. But the introduction of a computer makes it possible to classify a set of facts in a greater variety of ways and to access them more quickly. The system need not divulge the textual material. It may merely tell the inquirer where to go—what books or articles to read. But it may give him access to the underlying text as well. In the latter case the data to be stored may be very vast. A system to store such quantities of information in digital form may therefore be entirely too costly until mass memories and random access peripherals are substantially reduced in price. The greater likelihood is that the analysis of the interrogation will be conducted by means of computer programs and that summary information will be conveyed by computer printout, or on a display console. But the underlying data would be available by reproduction from microfilm storage, and it, too, could be accessed automatically and even communicated over great distances by facsimile transmission.

> The library of the future, as visualized at MIT, will be an electrically integrated network of information transfer services, providing access to books, journals and reports throughout the academic community. This network will be linked to sources and users outside the campus and coordinated by a central staff. Some of the services of this information transfer complex will closely resemble traditional library operations. In addition, there will be decentralized services to permit optical scanning of library materials in academic departments and research centers and for making hard-copy reproductions of desired materials immediately available for retention by the user. There may be teletype consoles connected with computer-operated bibliographic search systems. There may be book rooms for browsing. There may be "positive" information services for supplying unrequested documents to individuals whose professional interests are known. It is believed that the nature and scope of these services must be derived from experimentation.[13]

Phototypesetting would presumably play its part in the creation of more or less standard reports, such as selected indexes and abstracts of entries in the data collection. However, the information so disseminated can be made highly selective, as was suggested above. Just as the object data are capable

[13] *Current Research and Development in Scientific Documentation,* National Science Foundation Report No. 14.

of detailed classification, so is it also possible, by means of interest inventories and analysis of other characteristics of the potential user, such as his membership in professional societies, his occupation, avocations, etc., to create classes of users or members so that the information which they are likely to want *or should be made familiar with* would automatically be selected and disseminated. Such techniques could be highly selective, almost to the point of being individualized. This is perhaps the ultimate system because in such a case the retrieval function is performed even before the beneficiary of the system has interrogated the data base!

Before any generally-applicable system of information classification is developed which embraces all fields of knowledge, each branch of scientific inquiry will have created its own approach and put it to widespread use. (For example, the CODEN index of periodicals.) But it is not difficult to believe that someday all useful information will somehow be classified for instantaneous retrieval and that it may be mandatory or virtually so for every publisher to make available to certain "knowledge centers" a digitized record of the contents of the manuscripts he has published—all properly indexed, abstracted and coded for retrieval purposes according to a standard set of conventions (key words or thesauri). The ultimate system will have the capacity to search for concepts never specifically flagged for retrieval, and while much irrelevant data will be unearthed, much that had been lost or forgotten will be brought to light.

An illustration of preliminary excursion into such an area is a project of the State of Wisconsin. A contract has been let for the computerized typesetting of all current statutes and relevant codes, proceedings and the like. This material is to be stored for search and retrieval as well as for typesetting. Ultimately, the data base will be extended backward over time.

Speed and Volume Considerations. Some of the untapped markets for computerized composition were obliged to await the development of high-speed photocomposition devices and their use with sufficient intensity to assure a low per-unit cost of operation. It is hardly feasible to produce a large telephone directory by computerized composition except on high-speed equipment. Stock market quotations have been set and re-set every hour and kept standing in hot metal because time has not permitted such setting to await the closing of the market, even when the computer is added as a production tool. But with CRT devices these markets have now become available.

Reiterative Typesetting. As CRT composition machines become sufficiently cheap and reliable we will experience a significant increase in that typesetting which is reiterative in character—that is, where the same material is created not once but perhaps many times, with slight variations. In part this will be typesetting on demand, as suggested above—that is, the creation for a particular customer of retrieved material in a special context. To some ex-

tent it will arise from the desire of the author or publisher to re-work his material, either as to content or format, not unlike the manner in which proofs are now pulled from standing type for the purpose of revisions. The more convenient and economical it may be to generate typeset information the more prodigally—even wastefully—this will be done, just as we now turn out copies of documents on the office duplicator on the slightest provocation. The end product may not be printing in the conventional sense even though the intermediate product will be type. Attractive reproducible storage in microfilm or microfiche may even be more important. Or perhaps only a single copy will be created for the sole use of the researcher in response to his interrogations. However it comes about, we may safely predict not only that much new material will be set, but a great deal will be set many times. In an economy of abundance composition of pre-stored material might become as cheap as wrapping paper.

It is important to distinguish between regenerating stored information and the cost of inputting it for the first time. Unless optical character recognition greatly simplifies the present problem of input we can expect this aspect of typesetting—getting the data into the computer—to continue to be expensive or even to increase in cost because of the vital need to have it permanently correct and coded for a multiplicity of purposes.

Summary. New markets are being created by the explosion and implosion of data, and the output of computers will provide the input for typesetting. A great deal of such computerized photocomposition will be reiterative—how much will depend upon costs and the reliability of the system. An immediate obstacle is the shortage of relevant software. It is not easy to put one's finger on these markets in specific terms. We can only suggest and illustrate them, generalizing from those experiences which have so far come to the surface. A wise observer once stated that if one had determined the economic feasibility of the telephone, prior to its invention or active employment in society, by surveying the need for such communication as measured by the then existing volume of such exchanges, he would have been obliged to conclude that such a development would not be able to support itself. Similarly, the number of persons who journeyed between New York and Washington in the year 1800 could never have justified the construction of the railroad. (And, as a caution, let us remember the number of early railroad bankruptcies, despite huge federal land grants!) In a manner of speaking, the railroad and the telephone created their own demand. Even if demand is defined, as the economists state it, as a schedule of amounts that would be taken from the market (if offered) at a given time at a range of prices, including some well below costs, we must hasten to add that this entire schedule of demand—the curve of quantities plotted against prices—is capable of experiencing a rapid and forceful movement to the right (greater quantities being sought at the same range of prices) once the convenience

and value of the product in terms of satisfactions is more adequately understood.

What is true for computerized composition is true for other computer applications as well. The computer is a device we may have been able to live without, yet we could no longer do so! Moreover, its impact upon society has hardly begun to run its course. Typesetting is only one and perhaps, in terms of the totality of effects, a minor way in which the computer will make its irrevocable and far-reaching impression. And yet its most significant contribution may not be its hardware aspects but the *system* which it compels, the *analysis* and *diagnosis* which it invites and the ready, obsequious *tool* which it proffers. The computer is the catalyst of change but the nature and extent of the change becomes a function of man's stimulated ingenuity. It was not foreseeable, for example, that the electric motor would operate egg beaters, washing machines, oil burners, exhaust fans, refrigerators, air conditioners, tape recorders, phonograph turntables, sewer pipe reamers, drills, saws, planes and screwdrivers, car windows, garage doors, carving knives, toothbrushes, vibrators, revolving theatrical stages, and devices to control the "ullage" of liquid propellants in space ships! The use of computers for typesetting will cause typesetters to use computers for other things—first closely related and gradually more and more removed from their initial functions. The typesetter may himself become a knowledge or information center, or, storing the field of information which he would command, put it to use for his advantage as we can only imagine in the vaguest possible ways.

How to predict the course of technological adaptation? Dr. Lowell Hattery wrestled with this question in a speech before the I.E.E.E. meeting in Washington in February, 1969. Often the technology exists before the users are ready for it and one of the most difficult problems is that of forecasting user readiness. Habits that are entrenched, fear of change, management resistance, worker resistance, the need for retraining, problems of reliability and maintenance of the equipment itself, systems concepts and design and software development—these are all relevant factors. Some very obvious computer applications have so far not progressed simply because people, perhaps irrationally, will not submit to being identified by number. They do not want to be folded, spindled, or mutilated. *Management readiness* is one of the most fascinating imponderables and it is compounded of ignorance, prejudice and inability to formulate clear-cut policy decisions. Much that happens is therefore achieved in spite of management by low-ranking technologists who are hardly aware of the implications that paralyze their superiors.[14]

But over the past two years, and especially in the year 1968, the reluctance on the part of the industry to accept, and to take part in the promotion and development of, computerized photocomposition, was suddenly dissipated. Those who had been reluctant to have any part of it became eager to try

[14] Paper to be published in proceedings of conference. See Bibliography.

it, even to the point of submitting themselves to unnecessary demands and disciplines. It became the "in" thing. But on the whole the basis upon which it began to establish itself was not that of a fad since the technological and philosophic underpinnings of the process have begun to gain in appreciation. It may have been the sportsman and the playboy who first took to the automobile, but it was soon seen as the beginning of a new way of life, for the factory could leave the city and the schools and markets could move into the country, and new challenges and responsibilities were imposed upon all of us.

And so, in this chapter, we have described only the top of the iceberg. There is more to it, and how much more the reader will be able to divine for himself.

CHAPTER VII

DEVELOPMENTS ON THE NEAR HORIZON

In our 1966 report we made certain predictions concerning the evolution of certain responses to demand (and demand-creating developments). These were short-term forecasts. It will be of interest to review these and to see how close we were, or how far off, in order better to judge what may be foreseen from this point on.

1. *Phototypesetting devices will all be capable of being driven by computer-produced tape.*

   This is virtually true at the present time. The Linofilm CTR has been widely adopted with very successful results and the various Photon models which have been marketed are all computer-compatible. This is also true of the products of other manufacturers. Even the Alphatype can be so adapted, as well as the Monophoto. The Fotosetter and the Photon 200 models are still manufactured, but the vast bulk of phototypesetting machines today are tape driven. They may be operated by tape from manual keyboards but they are computer compatible.

2. *Many such devices—and all the high speed ones—will be slave units, though they will not necessarily and probably will not operate on line with a general purpose computer.*

   Only the Linotron 505, of all the CRT devices, can be run from justifying keyboards. Only the IBM 2680 is run on-line.

3. *Many will be compatible with magnetic tape input, eliminating the frustrations of paper tape.*

   Magnetic tape input is now common for all CRT typeset-

ting machines except the Linotron 505, and will shortly be available for this model.

4. *CRT typesetting devices will be limited to the generation of columns or page widths in the low 30 pica range for another 18 months, although it may be possible, within that time, satisfactorily to produce a somewhat larger page by photographic enlargement of the final image.*

   The Videocomp 830, capable of setting 70 picas, came out in 1968. The IBM 2680 can set a measure of 50 picas, and the Fototronic CRT 69 picas. The Linotron 505 has 60 pica capability. All of these machines became available (at least on order) in 1968.

5. *Newspaper-sized pages will be within the potential of high-speed photosetting (through the development of larger CRT tubes and photographic enlargement of the final image, plus some segmentation of the page) within five years.*

   This prediction will prove quite accurate although it may overstate the time required for this development by a year or so. While the Videocomp 830 achieves its 70 pica measure by enlargement of the image, the Videocomp 822X and the Fototronic CRT have applied the concept of page segmentation. The Fototronic, by its reverse-leading capability, has presently achieved a practical technique for setting full-sized newspaper pages. Several columns are set at one time and then the page is backed up and the film carriage is moved to the right so that the balance of the page can be set. A full-scale device of this kind has yet to be built but building it only awaits an order since there are no new principles involved. One limitation to this approach might be the difficulty of composing material wider than a single column when the page is so segmented. To do so would not require any additional hardware modifications, but the software would have to be devised to pick up running text in the middle of a line.

6. *Graphics (line, half-tone and color separations) will present no obstacle and the inclusion of such material will be a regular feature of computerized high-speed film typesetting within five years. Special logotypes, pre-composed ads and other illustrative materials will be held in computer storage for insertion on demand.*

   Logotypes and special symbols are now commonly generated by the Videocomp system. Later this spring RCA will announce its first models with line-art capability. Half-tones present

a not much greater problem so far as image generation is concerned. Permanent storage of art work poses only the problem of the size and cost of the storage devices. It is likely that art material will frequently be stored as microfilm images and regenerated by scanning techniques upon signal to the typesetting device. Such capabilities will be included in equipment which will be delivered and operational within the five-year span we had projected.

7. *It is probable that the large publication houses (in concert with related electronic firms) will take the lead in the on-line use of the computer for page makeup purposes. This will be a captive application. It will be many years, if ever, before commercial printing firms would be able to offer all-purpose computerized page makeup facilities applicable to slick magazines. When this occurs, it will be as a result of joint projects in which the publisher will take the lead, and it is just as logical (or perhaps more so) that the installation should be with the publisher as with the printer. It is hard to conceive that there could be any place for the small or medium-sized printer in the typesetting of nationally-circulated slick magazines, but this is already the case. The kind of special-purpose equipment which is now required for the pressroom would, of course, be necessary in the composing room, and it is probable that the number of dollars involved would be substantially greater than for multi-color web presses.*

Experimental work being done by Time-Life has not yet gone so far as computerized assistance in makeup of magazine pages, although new display techniques to enable make-up editors to visualize the appearance of their pages are already being applied. The next step in terms of makeup is for galleys of composition to be set and pasted into position, and then for commands to be given to cause the material to be reset as complete pages, so that the stripping is of a trial variety. Final composition will be in complete pages including art work, but we suspect that color separations will be handled as manual insertions for some time to come.

What is still lacking to make optimum use of the computer as a makeup tool is the ability to reformat pages or portions of pages on command and to display a visual replica of the page instantaneously. On-line display devices are not quite that sophisticated, but the limitations are still largely in the available software. The only deterrent to this development is the apparent

absence, at this point of time, of a major publisher prepared to make the necessary commitments to the development of such a system.

The balance of our 1966 predictions was concerned with the keyboarding problem and speculation concerning the use of computerized editing techniques. While our previous discussion of this topic still seems relevant it may be helpful to formulate the problem in somewhat different terms.

The next major change in the industry will occur with respect to the manner in which input is created. All of the following techniques will be used, depending upon the circumstances.

1. *Off-line keyboards with editing capabilities.* The MTST is the only device of this kind we are presently familiar with. It is now possible to use the magnetic tape output from these devices as computer input. One interesting feature of this type of equipment is the ability to copy-fit by setting the counter to a certain line width, replaying the material against a type face of a certain size, and thus very easily visualizing how much material will be required to fill a page, a chapter or a book. Even though the fit will not be precisely the same as the ultimate type, it will be much closer than at present, and re-scaling the material can be done easily with no need for re-typing.

   A second advantage of the MTST or MTSC is that the impact output looks so good that it may be given to authors for their perusal and if they are psychologically unable to make final changes until they see something "in type" this presentation may serve the purpose.

   Input terminals are quite inexpensive and can be used widely by authors who compose on their typewriters. These same input terminals can be used as ordinary typewriters when not otherwise occupied.

2. *On-line keyboards with editing capabilities.* There are a number of such systems in use today. The IBM Administrative Terminal System, The IBM Service Bureau Datatext and Call/360, the Astrocomp PDP-8 package, an on-line real-time service offered by GE—these are only indications of what is to come. Several computer typesetting installations have already indicated that they intend to offer to their customers access to a computerized editing capability. Some rather far-out plans of the McCall Corporation were publicized in 1968, contemplating input via radio-waves and satellite. Another recent announcement is that of

Composition and Retrieval Technology, Inc., an affiliate of Bowne & Company, which has declared its intention of offering an on-line, time-sharing capability in the field of text editing and composition.[1]

It is our expectation that there will be a large number of networks which, in time, may prove to be almost as common as the telephone, through which information may be input, revised, corrected, manipulated and updated.

3. *Service centers for data input will take over much of the work involved in the preliminary storage of text material which is subsequently to be edited and revised.* These service centers will have one or more of the following capabilities:

   a.) optical character recognition of single font or multi-font pages, representing newly-typed materials.

   b.) optical character recognition of multi-font typeset pages.

   c.) optical character recognition of pages especially typed for scanning by cottage-industry employees.

   d.) MTST input by cottage-industry employees. (One company, Computer Graphics, in Virginia, is making astonishing progress in recruiting and training housewives who will commit 100 hours per month.)

   e.) Paper tape input by cottage-industry employees.

   f.) Paper tape or magnetic tape input by input specialists with highly efficient keyboards and highly-trained personnel.

No doubt other possibilities, or combinations of those suggested above, will occur to the reader. What may well arise out of the use of these techniques will be a change in the nature of the typesetter's responsibility. If the author or publisher assumes the task of guaranteeing the accuracy of his own input one of the major bottlenecks inherent in computerized high-speed photo-typesetting will have been eliminated. Because of the possible importance of this development we should like to dwell upon it somewhat.

Two approaches may be taken to input creation. One is to provide machine-readable information without regard to the typesetting requirements which would subsequently be incorporated through program and coding. A second is to expect that the initial input will contain all necessary

[1] *CIS Newsletter,* March 1, 1969, Composition Information Services.

typographic information. The probable compromise will be that some typographic information will be contained on the initial input and some will not.

Information Included on Initial Input. It would not be difficult to expect that certain typographic information can be included, even by the author, such as:

a.) identification of upper and lower case characters.

b.) identification of paragraph endings.

c.) identification of compound word hyphens and avoidance of any others.

d.) identification of various levels of heads and sub-heads.

e.) distinguishing between fixed-space and variable space elements. (Some of this can be achieved by program. Sometimes it cannot.)

f.) special flagging of footnote references and a convention for where and how to input the notes themselves.

g.) calling attention to the existence of non-standard (pi) characters so that these can be inserted through editing.

h.) convention for indicating italics and bold face where not suggested by the structure of the manuscript itself.

i.) flagging special problem areas, such as tabular material, multi-level math (built-up characters) and complicated indentions.

j.) keying indexable words or other special terms to be extracted or otherwise manipulated.

Information Not Included on Initial Input. Conversely, it will be found too difficult to represent certain typographic information, either because the editor or input specialist does not know what kind of treatment is desired, or because of the absence of any well-established conventions.

We do not yet visualize the possibility that standard rules governing input could be accepted widely *unless it happens that one software-systems approach should come to predominate.* At this point of time it is possible to contemplate that customers would become linked to one of several possible sources of supply and identify their input coding with the requirements of these suppliers, whether Alphanumeric, Rocappi or one of the Videocomp installations. Obviously there are more Videocomp users, representing, at this point of time, a greater capacity than all others put together, but there has not developed among such users a standard input philosophy. Some

such users have not picked up the RCA software package, and among those who have almost all have made special adaptations for their convenience and for their customer requirements. Input conventions are therefore far from standardized. Thus what we visualize during the next ten years is that authors, abstractors and editors will become related by custom or choice to a given system of computerized photo-composition and prior to the creation of the initial input (where it does not already exist) will have worked out the unpleasant details of code structure and conventions required by that particular system (as well as those which the supplier would take the responsibility to insert), and would learn to use these elements.

For the most part, the input will be created in a highly generalized format. The manuscript will not yet be committed with respect to typeface, column width, page depth, use of display heads, or even treatment of extract and footnotes. Input will be keyboarded, recalled, and verified. It will not be necessary, of course, to check line or word breaks. Word division can safely be left to the computer system if one will accept a small margin of error. Moreover, when data are to be input for re-use through reiteration, the presumption is that it will appear in a variety of different output forms so that it would not be possible, in the abstract, to predict how given lines would break. What is desirable, if it can be achieved, is to hope that the originator would take responsibility for his own data, including its coding for retrieval and manipulation.

We do not foresee that this will happen in all cases, and we think it unlikely that it will happen in many cases in the immediate future. Meanwhile it will be possible to use high-speed photocomposition for reiterative typesetting of input generated by the computer composition house or pre-stored computer data. But the processing of new material will require a very considerable working force. Let us create an arbitrary model in order to grasp the dimensions of the input problem. Suppose we concern ourselves with the input requirements of a photocomposition center which has been operating three years and which has reached a shift schedule of ten hours a day for its high-speed composing device, of which 80% are free of down time. On the basis of 40 productive hours a week, let us assume that the throughput speed will be at the rate of 600 characters per second (in both final output and initial proofing modes). Suppose that one-third of the volume of output is represented by new input. The balance will be reiterative typesetting of pre-stored data. The reiterative material will not be produced in a proofing mode but new material will go through *two* proofing stages. New material would therefore be set three times, and average throughput speed would therefore be 200 characters per second, as contrasted with 600 characters per second for reiterative material. Hence, in an hour of photo-unit time, 720,000 characters of new material could be finally processed, or

2,160,000 characters of reiterative material. If 33% of the *output* (not time) is new material, and since it takes three times as long to set new material as old, the photo-unit would be at work four hours per day on new material and four hours per day on old. And in the four hours on new material, which it processes three times at the rate of 600 characters per second, it would therefore require one and one-third hours of new input, or 2,160,000 characters of new input per day. If a perforator operator or other keyboard expert could average 12,000 keystrokes for *all working hours,* including relief time, 180 hours of keyboard time would be necessary each day, or between 22 and 25 operators. In all probability, a like number of proofreaders or verifiers would be necessary.

If the machine runs faster in the proofing mode, our assumptions would require many more input keyboard operators. If only one proofing were required instead of two, the same would be true. Hence our illustration represents what might be considered a minimum configuration of personnel. If 50% of the output was new material, if the proofing run were conducted at 1,800 cps and if it were performed only once, then throughput speed on new material would average 450 cps and four and one-half hours, approximately, would be devoted to new output out of every eight on the photo unit. This would mean about 7,300,000 keystrokes of new input per day, or more than 600 hours of input time (and a similar amount of verifying time) per day.

The conclusion seems inescapable that a large number of input operators are going to have to learn the input system and a generalized approach to the input problem will ultimately evolve. It will be very broad and it will have to provide solutions for the dilemma of the character set as well as to cope with format codes.

The character set dilemma is a substantial one. Virtually every job requires the use of certain special "pi" characters. For volume production this problem cannot be solved on an *ad hoc* basis. The location of all pi characters must be known in advance and incorporated into the system. We estimate that about 180 standard type characters are required as a minimum, plus another 200 for Greek and math symbols, plus as many as 300 more for accented characters (although the "floating accent" method of producing these characters reduces the problem to more practical dimensions). All of these should preferably be available in families of roman, italics, bold, and perhaps bold italics. These families should also be capable of reproduction in styles, such as Palatino, Futura, Century, and so forth; and in many sizes.

From the standpoint of input, a keyboard of some 50 keys will have to provide for a shifting into some 10 to 15 modes so that these 50 keys will be able to describe some 700 characters. It is not clear that 700 characters would suffice. We have made no allowances for subscripts and superscripts (inferiors and superiors) or for subs to subs and supers to supers. The Mergenthaler study prepared for the Rome Air Center found that 1207 separate

characters would be necessary to handle subs and supers, for a total of more than 2,000 discrete characters for normal technical work.[2]

The need for some standardization of character set input requirements is beginning to be recognized.[3] The linking of information centers, the creation, on demand, of pages of type from material stored in digital format by such centers, is hardly practical in any sophisticated sense until uniform standards of character representation have been developed. The lack of understanding on this point may prove to be one of the biggest obstacles to a constructive development of our potential information resources.

Time Sharing. We have already stressed the significance of the development of time-sharing, real-time systems, providing the author or editor with a direct linkage to the computer, and the researcher access to a vast information store. It must be admitted that time sharing programs are complicated and expensive to write, but once the basic programs are available the subscriber can then write his own routines. An excellent description of perhaps the most advanced, and pioneering time-sharing activity (MIT's Project MAC) may be found in the article by R. M. Fano and F. J. Corbato (Time Sharing on Computers) in the September, 1966 issue of the *Scientific American.*

For typesetting, however, a vast amount of peripheral storage is mandatory. Some degree of human intervention, i.e., tape mounting, must be an integral part of the system, but with this modification a network of users could call their respective programs into memory and prepare their data for its ultimate use in typesetting. If a large company wished to devote its resources to the development of a universal, time-shared, multiplexed typesetting network such a system could be put together in five years or less but the cost would run to a good many millions of dollars. It is possible that if such a system were developed there would be less interest in high speed photo composition and more use of the less expensive output devices located next to the input source. A typesetting center could offer a choice, providing output through its own high speed machine or retransmission to the subscriber for buffered storage and eventual use on his own typesetting equipment. It is not easy to predict, at this stage, whether time sharing and long distance communication on a large computer or intensive use of one's own smaller computer would be more economical. Data transmission costs are dropping. Shared computer time is getting cheaper in terms of its effective use. But reliable typesetting software for either application is still awaiting refinement. Such software is closer to realization for small-to-medium computers on the premises than for time-sharing. But larger computers, economical

[2] Rome Air Development Center, Research and Technology Division, Air Force Systems Command, Contract AF30 (602)-2624, dated January 31, 1963.

[3] See Stanley Rice's article in *Publishers' Weekly,* or *Book Production Industry.* Consult bibliography.

only through time-sharing, would be able to do a much more sophisticated job of processing and outputting typographic information.

In our 1966 report we stated:

> Within five years we expect a good many entries into the computerized photocomposition field. There are a fair number already. Most of these use simple, packaged programs of hyphenation and justification. Limited attempts at correcting and pagination will be carried on. A few firms will make major commitments to enter the field, expecting to spend a good many hundreds of thousands of dollars on equipment, software and training.

If anything, we underestimated the extent to which industry was prepared to make major financial commitments. There is a greater willingness to spend money on hardware than on software, perhaps because the industry can understand *things* better than they can *concepts.* In our opinion, too much money has been spent on hardware, which cannot yet be used efficiently, and not enough on software and systems.

Computer Time as a Factor. One of the most interesting problems to study has to do with the possible ratio of computer time to photocomposition time. Just as we went through an exercise concerning the possible relationship between input and photo output, so a similar examination of computer processing time to photo output is necessary to a full appreciation of the implications of present developments.

As a general rule, users, customers and hardware salesmen have vastly underestimated the amount of computer time necessary to process information for typesetting. Many of the existing computer typesetting software systems are too slow to be used realistically and economically to engage fully a high-speed photocomposition device. Some of the photocomposition devices may make unusual and unreasonable demands upon the computer. An interesting and extremely significant analysis of this problem can be found in the special study made at the initiation of Printing Industries of America by Jonathan W. Seybold, also of Rocappi, Inc., entitled *Report on Cathode Ray Tube Character Generation Devices.*[4] He does not analyze demands upon the computer occasioned by the typesetting software itself (and this could well be the subject of still further investigation) but only the demands imposed upon the computer in order to create output for the typesetting device (assuming all formatting, hyphenation, justification and the like has already been completed). This is not the sole purpose of his study, which is perhaps primarily concerned with the capabilities of various CRT typesetting devices,

[4] Prepared for the Character Generation Committee, Computer Section, Printing Industries of America, 1969.

but his analysis looks at these devices *in a systems environment* and hence comes to grips with the problem of the relationship between computer and character generator. He examines a series of "typical" jobs—pages in different formats, with different degrees of complexity so far as type face and style are concerned. The results of the comparison are dramatic. In a final table which expresses the amount of time required by the computer to provide the typesetting machine with font information, he finds that one device might demand of the computer so much time that the computer could only effectively process *eight pages an hour* (not considering time for normal hyphenation and justification or pagination passes), whereas another CRT device, producing the same or substantially similar output, might require *no computer time for this purpose.*

to provide input to the photosetter (which, perhaps being off-line, may run very fast once the information is fed to it) our conception of the relationship between input, computer, and output device must also take into account the possibility not only that many input stations will be required to feed the photo unit, from many locations, but also that many computers might be required to be similarly engaged. This may mean that those who have CRT devices may find themselves engaged to a large extent simply in the business of selling time to people with computers who have output to process. Their chief stock in trade, aside from having the device upon which to set type, will be the ability of their technical staff to communicate the machine's requirements to their potential customers.

CHAPTER VIII

WHITHER COMPETITION?

Competition from Outside the Industry. From what we have already said it may be surmised that we expect the development of a substantial amount of competition in computerized composition from outside the industry.

Competition from the "Customer." The customer with a large volume of typesetting of a relatively standard format, where his input would derive from other data processing applications, would be most likely to enter the field of computerized photocomposition, although not necessarily competitively. He may be content to generate his own work. But if, as in the case of General Motors, where the initial application is the setting of parts and price lists, there are other relatively standard jobs which are normally typeset by conventional means, such as instruction and repair manuals, it is tempting and perhaps logical, so long as the output facilities are available, to withdraw other jobs from the market place.

Existing Data Centers. Existing data centers may plan to enter this field. It was in this fashion that International Computaprint's operation in the United States was formed, as an offshoot from National Computer Analysts. Several large companies specializing in systems work, programming and computer center operations, have explored the possibility of moving into typesetting as a means of providing more intensive utilization of their existing computer equipment, or their software capabilities, or as an outgrowth of their work in information retrieval. CEIR, University Computers, or Computer Usage might be cases in point.

Government. The government is deeply involved in related areas of activity. Its role, through the GPO, in stimulating the development of high speed CRT devices, is well known. Not only the GPO, but the CIA, the Air Force, the Department of Defense, the Atomic Energy Commission and the De-

partment of Health, Education, and Welfare, have made substantial commitments in the area of computerized photocomposition, or are studying the feasibility of doing so. The Library of Congress advertised its desire to create a capability of producing library cards on demand, which led to an order for the installation of two Videocomps. The Commonwealth of Pennsylvania has already installed a Videocomp. The plans of the Federal Government to create information centers, or to support them, are also relevant. It is conceivable that a great deal of the expansion of typesetting which we have predicted will relate to the information center type of activity. Such centers would tend to specialize in the production of bibliographical and abstracted material as well as in the typesetting of lists retrieved in response to specific demands.

Non-profit Bodies.

Non-profit bodies such as universities and professional societies or associations are engaging in this activity at present and will continue to do so. Most of these professional societies have their own publications, such as *Chemical Abstracts.* Very substantial public funds have been made available to certain of these institutions for the development of computerized information handling. In at least one case (the American Chemical Society), grants in excess of a half million dollars have been awarded for the purpose of developing typesetting capability. A substantial grant was made available to the American Mathematical Society for the purpose of exploring photocomposition of mathematical formulae. The announced policy of the American Chemical Society very clearly links typesetting and retrieval and their work in this field is well advanced.

M.I.T. and the University of Pittsburgh are among those institutions that have carried on extensive work in computerized composition. In fact, some of the pioneer insights were developed by Professor Michael Barnett when he was at M.I.T. There is even some indication that such institutions may be willing to make their facilities available, directly or indirectly, for typesetting activities for others, especially for government and not-for-profit corporations, although these consumers of typesetting are among the most extensive generators of information, since they include professional societies and foundations.

Universities are able to obtain their computer installations for a fraction of the cost of that required in private industry. Educational discounts for computer leasing or purchases are well established and are substantial. In many cases labor and programming costs are cheaper or non-existent.

New Industry Combinations.

New industry combinations have been formed with plans for action which may or may not imply entrance into the field of computerized composition. RCA and Random House; General Electric, Time, Inc. and Silver Burdett's venture as the General Learning Corporation; Xerox's acquisition

of American Educational Publishing, as well as University Microfilms, R. R. Bowker and Ginn & Co.; Time, Inc. and Little, Brown; Raytheon and D. C. Heath; IBM and Science Research Associates; CBS and Holt, Rinehart & Winston as well as W. B. Saunders; the McCall Corporation's substantial ownership of stock in the American Broadcasting Company—these are some of the straws in the wind. Acquisition of the Printing Corporation of America, and subsequently, Poole-Clarinda and Poole Brothers, by the American Can Company represents a significant combination. Arcata National Corporation has acquired Atlantic Microfilm Corporation, J. W. Clement, Kingsport Press, and Butler Data Systems. A new empire is in the process of formation under the name of Diversagraphics. Datagraphics in Chicago, was thus recently acquired, and General Educational Services has announced acquisition of Black Dot.

In the case of some of these mergers references were made to the federal government poverty programs, the need for large sums to be devoted to the development of teaching machines and the production of specialized reading material and new learning approaches for the underprivileged. There is also a great deal of discussion about "non-books" and learning as a total experience (a "happening") rather than as something which relies upon exposition and the printed word. Psychological experiments seeking to penetrate the barriers to learning suggest the use of computers, along with a variety of aids, as extensions to the learning process. A recent announcement of the use of lasers to create a photographic "thumbprint" of three dimensional objects suggests that such experiences could be as big as or bigger than life.

IBM and GE and others are moving into the "data bank" business. For example, the Industrial Marketing Division of IBM offers industrial firms market research reports compiled from Dun and Bradstreet and an I/O model of the industrial economy.[1]

In all mergers described above more intensive and more extensive uses of computers are implied. What is probable is that certain materials previously destined exclusively for the book or magazine markets will be processed in a wider variety of ways: for storage and retrieval, for teaching machines, for printing, for "happenings" and for man-computer dialogue.

The kind of dialogue we are referring to is not mere selective retrieval. The computer can be programmed to relate simultaneously to a wide variety of events in such a way that the process of reacting to man's comments and questions may take on a creative aspect.[2]

The ability of the computer to provide individualized responses is stressed as one of its most valuable assets in the teaching process.

[1] Datamation, p. 89, June, 1966.

[2] See especially three articles in the September, 1966 issue of the *Scientific American:* "Information," by John McCarthy, "The Use of Computers in Education," by Patrick Suppes, and "Artificial Intelligence," by Marvin L. Minsky.

We look upon the activities of certain of these large corporations, of government and of not-for-profit institutions not so much as competition in the sense that they will provide computerized composition as that they will furnish alternatives that may, to some degree, substitute for books and magazines. To the extent that information can be retrieved on demand it is not necessary to publish what people will not need until they want it, and then it is necessary only to give them specifically what they need. And it will be possible to provide certain kinds of information without recourse to typesetting at all. "No stretching of the demonstrated technology is required," says John McCarthy, "to envision computer consoles installed in every home and connected to public utility computers through the telephone system.... Everyone will have better access to the Library of Congress than the librarian himself now has. Any page will be immediately accessible.... Full reports on current events will be available for the asking...."

It is logical to suppose that firms having the capability for the storage and manipulation of information in relation to a variety of media and applications will be most advantageously situated with respect to any one of them.

Competition Inside the Industry. We have endeavored, in Appendix I, to summarize the essential facts concerning the installations and equipment now in use, especially in the United States. As will be noted in the credits set forth in that appendix, we have relied most heavily upon data provided by Composition Information Services. The CIS Newsletter and other publications from publisher Arthur E. Gardner are absolutely indispensable for anyone who is seriously concerned with staying abreast of new developments in the printing and publishing field today.

The reader will surely be impressed by the large number of firms having already made a substantial commitment to photocomposition and computerized composition. Only a handful of the firms listed had any such equipment in use two years ago.

For the most part we may state categorically, however, that the installations enumerated are not profitable as yet. Very few firms which have entered this field in any major way have as yet recovered their costs. This is even true of the Government Printing Office where there is an optimum opportunity to obtain the needed volume and to select the most advantageous applications. But the facts are now rapidly changing. Firms with several years of experience behind them are beginning to meet their incurred expenses. They are finding the appropriate markets and the systems necessary to respond effectively to the market demands. Some have withdrawn from the field. Others have shifted, already, from one computer to another, or from one typesetting device to an alternative choice. It cannot yet be said,

however, that there is as yet any "settling down." Many more firms will enter the arena in the next several years; new approaches and new equipment will be introduced. But the following types of establishments may now be identified as more or less permanent participants:

a.) large printers, such as R. R. Donnelley, the McCall Corporation, Western Printing & Lithography, the Printing Corporation of America, Cuneo Eastern Press, and Kingsport Press are becoming more and more deeply involved,

b.) new firms with no prior printing or typesetting affiliation have come into being, although they have been financed, in whole or in part, in most cases, by capital obtained from printers or publishers. Typical of such firms are Sedgwick Printout Systems, Videographic, Rocappi, Datagraphics, Automatech, International Computaprint, and Computype.

c.) surprisingly, and perhaps significantly, practically no trade typesetters have entered the field. Michigan Typesetting is one of the few of its kind to have done so, although one of the outstanding photocomposition houses, Graphic Services, has recently taken steps, operating a PDP-8 with Fototronic equipment. There was some identification of a group of members of the ITCA (International Typographic Composition Association) with Computer Composition of Flourtown, Pa., in that perhaps a half dozen such firms provided relatively nominal financial participation in exchange for certain franchise or distribution rights. We understand that Computer Composition is now controlled by Logan Square Typesetting in Chicago.

d.) there are also, of course, the government installations.

e.) only one of the major entrants came into the industry as a result of the development of its own hardware. Alphanumeric is both a service center and a manufacturer of high-speed CRT photocomposers.

Aside from the government installations, the remainder seem to fall into two categories: those who are truly service centers seeking to offer "to the trade" a computerized composition capability; and those who perform the function primarily for themselves, as part of a total line of commercial printing activity. Sedgwick Printout Systems is perhaps different from the other service centers in that this company has concentrated primarily upon selling the use of its *equipment* rather than its computers and its software.

The "trade shop" concept is not strictly applicable to the field of computerized composition, however, because there is a higher degree of contact with the ultimate customer (who is, in a sense, outside of the "trade") than is usually the case. There is perhaps more likelihood that these service centers will be related more intimately to the customer (especially the publisher) than to other suppliers, owing to the nature of the communications problem. This has always been more true of composition than of binding because "preparatory" work, including photoengraving (and even lithographic platemaking, in some cases) needs this intimate relationship. But the computerized composition facility will become even more involved in editorial processes and functions and perhaps to an increasing degree will find itself in a special category standing between the publisher and his printer.

One trend that we have not witnessed to any important degree, but which we believe will become more evident, is the publisher's direct participation in the process of computerized composition. It seems to us highly probable that this will occur to a significant extent, but it is not likely to take place until software systems, more or less trouble free, can be supplied.

Union Participation. Virtually all of today's installations are non-union. This is in part true because new firms, with no prior ties to the Typographical Union, have sprung up. It is probably true, moreover, that certain firms with established union relationships have sought to innovate in a freer environment than they felt they might experience with union involvement. It is also unquestionably the case that many unionized firms have felt that it would not be possible to move into this area with union cooperation and that the union would, in all probability, prevent their entry on reasonable terms.

It may be stated, however, that the Typographical Union has not categorically opposed these new techniques, and in some jurisdictions there has been a degree of openness to experimentation without ultimate commitment on the part of either party. We may therefore predict that there will be a greater degree of participation in this typesetting revolution on the part of union shops. The existence of non-union competition will of course create a greater degree of union acceptance. Present obstacles are more ideological, jurisdictional, and procedural than they are economic. Differences in wages and conditions are not so great as to bar the possibility of a unionized shop competing effectively.

The major problem with the union will come in connection with the acceptance of material prepared outside of the shop, and unless the Typographical Union is willing to formulate a very broad view of this problem, taking into account the implications of machine-readable documents and editorially-created input, the Union will find that its role will become less and less relevant to the needs and demands of the industry.

CHAPTER IX

HOW CAN THE INDUSTRY RESPOND?

Problems of Competence and Understanding. The first obligation of a printing manager is to begin to understand what is happening in this revolution and how computers will play their part. He can't expect to get this understanding easily or free. He will not get it if he merely listens to the fantastic promises of the hardware salesmen. His best and cheapest answer will be to find a service center he can work with and learn by feeding work into that center, starting with simple typesetting applications and then looking for some work which offers data-processing-related by-products. He should seek this experience not merely as a customer but should look for the opportunity to get directly involved in the production process, trying to use the center or facility as a kind of laboratory. Whether he will be successful in this objective will depend upon the degree of cooperativeness or the degree of secretiveness of the supplier.

Bearing in mind the tremendous problem of generating enough input he should try to make arrangements to handle his own input, with the expectation that most of the input he originates for a number of months will be lost motion so far as producing a final product profitably is concerned. He need not install his own computer in order to get this experience; he should be able to make appropriate arrangements with someone else.

Simultaneously, he should learn as much as possible about tape and film composition. His next step would be to install his own medium-scale photocomposition equipment, or to make arrangements with someone who already has such equipment to share its use. He should try to learn the good and bad points of such equipment, such as:

a.) which equipment is the most reliable?

b.) which requires the most maintenance?

c.) which produces the highest quality work?

d.) which offers the greatest variety of type faces?

e.) which will set most cheaply on straight matter?

f.) which will set most cheaply on complex, multi-font composition?

g.) how hard is the machine to program for computer operation?

h.) how flexible are the font arrangements?

i.) are there differences in throughput cost for one machine as compared to another (in the computer output stages)?

j.) are the type characters bottom aligning? If not, what limitations, if any, are implied?

k.) how does the machine handle leading variables? in what increments?

l.) how wide a measure can be set? How can multi-column work be handled?

m.) are there limitations on the number of characters that can be set in a line due to "buffer" capacity?

n.) how will last-minute corrections be made?

o.) what are the merits of film vs. paper for output?

p.) what kind of proofs can be obtained? How satisfactory will they be?

q.) how reliable is control over the film or paper?

r.) to what extent, if any, can set-width values be varied to create special effects?

s.) how would tabular material be set? Are there multijustification features on the machine?

t.) what training is available for maintenance personnel?

u.) what has been the experience of other users in obtaining parts, fonts?

v.) will the machine respond to non-computerized input? Is this essential to the system which is planned?

These are only a few of the questions he should know enough to answer before he makes any decision with respect to a conventional (non CRT) photo-unit. The questions which are raised in connection with CRT devices are much more complex. They have to do with the ways in which fonts are stored, the length of time it takes to access them, what this implies in terms of computer time, the quality of the image in different point size ranges, the availability of computer programs, training, parts and back-up and many more perplexing problems which will necessitate many months of research, or perhaps the assistance of outside counsel. Unfortunately, in this area there are very few people qualified to advise who do not have a vested interest in a particular solution.

On the whole it is highly desirable to reduce to a minimum the number of variables that are to be dealt with at any one time. We speak from our own bitter experience in this connection. For example, Rocappi made an early mistake of trying to get started with not one, but two completely untested models of perforation units which proved to be utterly unreliable. For a long time, too, it was not possible to isolate the errors attributable to the photo-unit as contrasted with those arising from computer or program malfunction. Here are only a few of the questions that will have to be considered and isolated if one takes the plunge all at once:

a.) is the keyboard functioning properly?

b.) does the operator know how to keyboard for computer input?

c.) is the paper tape reader working faultlessly?

d.) is there the possibility of malfunction within the computer?

e.) how about the tape stations? What about the condition of the mag tape?

f.) is the output punch reliable?

g.) if conversion to another form of paper tape is required, how good is the converter?

h.) does the photo unit paper tape reader work properly?

i.) what functions within the photo-unit could go wrong?

j.) most important of all, what about the program itself, and how can we tell whether or not the program is at fault?

k.) what about the tables of set-width values and the location of special characters? Are these tables accurate? Do they correspond to the information given by the manufacturer? If so, is the

manufacturer's information correct? Do the widths in the computer program agree in fact with the plug-board widths or other stored values? Do their locations correspond with the program's expectations?

It can be seen that our questions are oriented toward a paper tape system and a second generation photo unit. This is because more of our readers are likely to be thinking in these terms to start with. Moreover, we believe that experience with a smaller system is highly advantageous before moving on to something more ambitious and demanding.

When it comes to the programming aspects, we can suggest literally hundreds of questions which should be known and the answers understood before one can sell or produce creatively via computer, if the computer's full potential is to be realized in any significant way. Learning what a computer program can do is like learning the intricacies of a new language. A knowledge of and appreciation for its complexities and its possibilities grows on one and a creative interchange between computer and programmer begins to take place.

Problems of Resources. The cost of experimentation can be considerable. Nothing was ever accomplished within the projected time span. No program of this kind can be counted upon to work reliably in every situation for years because of the large number of variables involved. In this sense, no program is ever thoroughly "de-bugged." If one is going to enter this field all at once, he must be prepared to spend large sums on learning and re-doing, and it may be years before he achieves even 50% efficiency on the part of his equipment, programs and personnel.

Problems of Timing. We are familiar with one large and very successful corporation which has a studied policy of never spending a nickel for research and development. It seeks to acquire the experience of others, and to buy other firms once they have settled down. Not only do they thus avoid the cost but, more especially, the nightmare and the internal political crises inherent in the experience, which can shake even a large company to its very core. At any event, the problem of moving into this field is to determine that point in time which is neither too early nor too late.

Problems of Communication. The need to interpret one's moves to customers, employees, suppliers and interested bystanders, important as it is, is nothing like the problem of keeping one's own organization informed of what it needs to know and of developing two-way communications. How much detail should people know? How far down the road in program development can you go without a review by people at all levels? How will they be qualified to pass judgment and to help? How can they be made to understand what is possible and what is not?

The first problem is to understand that those who believe "our computer can do anything," or "our programmers can write any kind of program," must begin to think in terms of "how much?", "how long?", "what use is it when it is done?" and "how else could we go about it?" The rule should be *not* to write a program if you can avoid it. And equally important: *not* to change an existing program unless or until it is absolutely necessary.

The salesmen, in particular, must be held in check, for they will sell anything, promise anything, and leave it up to the programmer to deliver. Sooner or later will come a day of reckoning. The chances are that by that time the original salesman will have been promoted, transferred or fired. You will be left holding the bag.

One cannot overstate the seriousness of the communications problem. It will never be solved with any major degree of satisfaction.

Problems of Scale. Perhaps the most difficult problem of all is the problem of scale. How is it possible to link the computer, with its tremendous speed and capacity, and the high-speed photo unit, into the shop of the small, medium-sized, or even large printer? How can the logistics of scheduling and volume be resolved when one considers the program bottlenecks, input bottlenecks, proofreading bottlenecks, and all of the other limitations? Perhaps the entire structure of the industry will have to be revamped before the appropriate elements of scale can be brought into focus.

The Problem of the Transitional Technology. Most serious of all is the fact that the technology we are discussing is still highly transitional and it may be that we are in an epoch so volatile that many years will pass before this ceases to be the case. It is therefore simply not possible to wait until the major technological possibilities have been definitively determined. If one is ever to become involved he must begin to do so, because only when he has established some sort of foothold can he build the foundation he will require for intelligent participation. Even then he may bet on the wrong system or machine. There will be no way of foretelling what else may be in store.

Problems of Customer Readiness. For some months and years now customers have been extremely reluctant to accept or to specify computerized photocomposition, and it is for this reason that the in-house environment has been the easiest one in which to launch such a venture, for here readiness can be mandated and type of product can be pre-selected. But in the customary trade markets this condition of negative acceptance is now rapidly changing. Production managers and personnel were uneasy with the quality of the product and uncertain concerning its reliability. Moreover, they were totally unfamiliar with what was involved and in no position to appraise the degree of success or failure in relation to other similar alternatives. They were also extremely reluctant to run any personal risks in view of the antagonism on the part of authors and editors.

For the most part, it required policy decisions at the corporate level before production people were willing to take any chances, even in those areas where the advantages could be dramatic. Top people in the organization had to share some of the responsibility for the success or failure of the undertaking. Suppliers of computerized photocomposition have been hesitant, moreover, to have their capabilities assessed by their performance of one problem assignment, frequently produced in a hostile or critical environment, since in every new application there are problems of communication and selection, and there are a number of options. Usually the experiment has been conducted on the basis of how well the System can achieve results precisely like those of conventional typography, and while it may be possible to win acceptance on the basis of this sort of scutiny, these are not precisely the terms upon which the computerized photocomposition supplier would prefer to complete.

Given, now, the dramatic about-face of the industry, so that there is eagerness to innovate, and acceptance of the fact that failure to look closely and to learn about these new processes may well imply serious competitive setbacks at a not-too-distant date, the major problem is how to establish the most creative interface between customer and supplier, and how to involve the customer in a learning experience at all relevant levels, including production and editorial staff, business and marketing personnel and corporate executives.

Hostility has, however, been replaced in some areas, by a breezy familiarity with the superficial aspects of the process, displayed by people who dare not risk exposing their ignorance and who are temperamentally given to intuitive or snap judgments rather than to cautious and thorough analysis. There is perhaps as much danger from this attitude as from the former contempt for innovation, and usually a balanced posture with respect to new processes can best be achieved by the involvement of at least several people of different temperaments and backgrounds.

When the next edition of this report is prepared, perhaps a few years hence, we expect that the story to be described will be one of solid achievement and a more definite categorization of applications than is now possible. At this stage, as the reader will have observed, we are still dealing with omens and propitious circumstantial conjunctions, and our role is in part that of a soothsayer. But it is this sort of informed speculation which provides the scientific, philosophical and emotional basis out of which decisions are made. Because of this, those who predict may provide some of the motivation, something of the frame of reference, and some of the insights which will in fact give direction to the future course of events.

End

A Last Word

Composition Information Services (CIS Newsletter dated April 1, 1969) calls our attention to a report from the firm of Arthur D. Little entitled "The Phototypesetting Industry," which endeavors to project the size and shape of the market for photocomposing devices and related equipment. According to CIS, the report estimates that "the total typesetting market will grow 25% per year from about $117 million in 1968 to $355 million in 1973," and that even greater growth is predictable if practical adaptations can be made to move from film to letterpress platemaking.

CIS states that the Little report estimated 3,000 phototypesetting machines in operation, with 34% of the new installations going to Photon, which presently has 50% of all phototypesetting equipment installed.

Apparently the Little report projects the greatest growth in the two ends of the spectrum—the high speed CRT devices and the low-cost units. No reference is made in the summary to any consideration of software availability, or the extent to which computers are relevant to the growth of the industry except to observe that "phototypesetting has proved to be a natural companion to high-speed electronic developments." This writer continues to feel that the central problem remains what it was before—the problem of creating a *total systems approach* with appropriate program support, and the knowledge of how to use software, hardware and photocomposition equipment in a production environment.

APPENDICES

APPENDIX I

COMPUTER-TYPESETTING INSTALLATIONS

A survey by Composition Information Services as of the end of 1968 reports 821 computer typesetting users, representing a growth of 54% over the previous year. This amounts to 287 new installations. Newspapers account for nearly two-thirds of the total. Of all installations, approximately one-third involve one or more photocomposition devices.

In the following summary we have shown newspaper installations only if they involve the use of photocomposition equipment, and only in the recapitulation by "device" rather than in the alphabetic listing.

Although the number of computerized photocomposition installations is substantial, the capability of most of those listed is limited to hyphenation and justification. Systems which incorporate correction routines are relatively rare, and those with general-purpose pagination capabilities are extremely rare.

COMMERCIAL COMPUTERIZED PHOTOCOMPOSITION INSTALLATIONS IN THE UNITED STATES

(Exclusive of Newspapers)

	Device	Computer
Acme Ptg. Co., Medford, Mass.	Linofilm Quick	IBM 1130
Alphanumerics, Inc., Lake Success, N.Y.	IBM 2680 (APS-2)	IBM 360/30/50
American Charts Co. Atlanta, Ga.	Photon 713	Burroughs 263
American Typesetting, Chicago	Monophoto	IBM 1130

American Yearbook Co., Topeka, Kans.	Photon 713	IBM 1130
E. C. Art Publishers Chicago	Photon 200	IBM 1130
Auto-Graphics, Monterey Park, Cal.	Photon 713 Videocomp 822	Fairchild 230 RCA Spectra 70/35
Automatech Graphics, New York	Linotron 1010	IBM 360/40
Baird-Ward, Nashville, Tenn.	Fototronic CRT	IBM 360/30
Black Dot Phototypesetting Crystal Lake, Ill.	Linotron 505	SDS Sigma 2
Bru-El Graphic Bailey's Crossroads, Va.	Photon 713	Honeywell H-200
Central Typesetting, San Diego, Cal.	Photon 713	PDP-8
J. W. Clement Co. San Francisco, Cal.	Photon Zip	IBM 360/30/40
Colonial Press, Clinton, Mass.	Fototronic CRT (on order)	Honeywell H-120
Computer Composition, Flourtown, Pa.	Linofilm	CDC 160A
Computer Graphics Denver, Col.	Linofilm	IBM 1620
Computer Photocomp Kansas City, Mo.	Photon 560	IBM 1130
Computer Photo-Typesetting Mt. Rainier, Md.	Photon 713	IBM 1130
Computype St. Paul, Minn.	Photon 200 Videocomp 820	IBM 360/40
Copley Press La Jolla, Cal.	Photon 713	IBM 1130
Datagraphics Chicago	Photon 560	IBM 1410/1440

Dewberry Engraving Co. Birmingham, Ala.	Photon 713	PDP-8S
R. R. Donnelley Chicago	Photon 560 Videocomp 830	IBM 360/40 GE 415
Edwards Bros. Ann Arbor, Mich.	Photon 713	IBM 1130
Fotocomp New York	Photon 713	PDP-8
Graphic Arts Data Service Chicago (Cuneo)	Photon 713	RCA 301
Graphic Image Corp. Chicago	Alphatype ATF Typesetter Photon 713	IBM 1130
W. F. Hall Chicago	Fototronic	Honeywell H-200
International Computaprint Ft. Washington, Pa.	(Videocomp on order)	RCA Spectra 70/45
Inforonics Maynard, Mass.	Linofilm	PDP-1
Jackson Typesetting Jackson, Mich.	Photon 713	Fairchild Comp/Set
William J. Keller Buffalo, N.Y.	Linofilm Quick	Linasec
Keys Ptg. Co. Greenville, S.C.	Linofilm Quick	JusTape
Kingsport Press Kingsport, Tenn.	Photon 540	IBM 1130
Kutztown Pub. Co. Kutztown, Pa.	Linofilm Quick	JusTape
Latham Process Corp. New York	Photon Zip	----
Lane Press Burlington, Vt.	Linofilm Quick	IBM 1130
Mack Ptg. Co. Easton, Pa.	Photon 713	Honeywell H-200

Metropolitan Ptg. Co. Elk Grove, Ill.	Linofilm Linofilm Quick	PDP-8
March Photo New York	Photon 713	PDP-8
McCall Ptg. Co. Princeton, N.J.	Videocomp 822 Photon 713	RCA Spectra 70/45
Mennonite Publishing House Scottdale, Pa.	Photon 713	IBM 1130
Michigan Typesetting Detroit, Mich.	Videocomp 820	RCA Spectra 70/45
Mid-America—Web Offset Omaha	Photon 200	Honeywell H-200
Mid-America Ptg. Co. St. Louis	Photon 713	IBM 1130
Mission Photocomposition Merriam, Kans.	Linofilm Linotron 505	IBM 1130
Monumental Ptg. Co. Baltimore, Md.	Fairchild Phototextsetter 2000	Fairchild Comp/Set
National Engraving Co. Birmingham, Ala.	Photon 713	PDP-8S
Nebraska Pub. Co. Lincoln, Neb.	Photon 713	Honeywell H-200
Perry Publications W. Palm Beach, Fla.	Photon 713	RCA 301
Phillips and Van Orden San Francisco	Photon 901	IBM 360/30
Photo-Comp Encino, Cal.	Photon 713	IBM 360/40
Photo-Image Chicago	Photon 713	PDP-8
Photo Data Washington, D.C.	Linofilm Quick	IBM 1130
Poly-Tech Industries Detroit	Photon 713	IBM 1130

Poole Bros. Chicago	Linofilm Linofilm Quick Videocomp 830	IBM 1620 RCA Spectra 70/45
Regency Thermographers Waynesboro, Pa.	Photon 200	IBM 1130
Richardson, Bond & Wright Owen Sound, Ont.	Photon 713	IBM 1130
Rocappi, Inc. Pennsauken, N.J.	Fototronic CRT Photon 713	RCA 301
H. F. Roebuck Baltimore, Md.	Linofilm Quick	Linasec
Science Press Ephrata, Pa.	Photon 713	Honeywell H-200
J. Shuler Co. Buffalo, N.Y.	Photon 713	Honeywell H-200
So. New England Typo Services Hamden, Conn.	Linofilm Quick	IBM 1130
Sedgwick Printout Systems New York	Photon 901 (Videocomp 830 on order)	-----
Time Inc. New York	Photon 200 Videocomp 822X	RCA Spectra 70/45
Trade Composition Co. Springfield, Mass.	Fairchild Phototextsetter 2000	Fairchild Comp/Set
Tower Typesetting Chicago	Linofilm Quick	Linasec
Tweddle Litho St. Clair Shores, Mich.	Photon 713	Honeywell H-120
Vail-Ballou Binghamton, N.Y.	Linofilm Quick	Linasec
Web Offset Publications Toronto	Photon 713	IBM 1130
Wellington-Attas Bergenfield, N.J.	Photon 713	PDP-8

Western Ptg. & Litho Poughkeepsie, N.Y.	Fototronic	IBM 1401
Williams Press Chicago Heights, Ill.	Linofilm Quick	JusTape
World Graphics West Caldwell, N.J.	Linofilm Quick	JusTape
Videographic Systems Hauppauge, L.I., N.Y.	Videocomp 820 (830 on order)	RCA Spectra 70/35/45

COMPUTERIZED PHOTOCOMPOSITION INSTALLATIONS
(Including Newspapers)

By Type of Photo Unit	Computer
Alphanumeric Photocomposer (APS-2)	
Alphanumeric, Inc., Lake Success, L.I., N.Y.	IBM 360/30/50
Alphatype	
Commerce Clearing House, Chicago	Honeywell H-400
R. H. Donnelley, Oakbrook, Ill.	IBM 360/40
Graphic Image Corp., Chicago	IBM 1130
ATF Typesetter	
Graphic Image Corp., Chicago	IBM 1130
Meriden Record-Journal, Meriden, Conn.	PDP-8
Middletown Press, Middletown, Conn.	PDP-8
Pawtucket Herald, Pawtucket, R.I.	PDP-8
Photo Image, Chicago	PDP-8
Compugraphic (CG)	
Beverly Times, Beverly, Mass.	JusTape
North Platte Telegraph, North Platte, Neb.	JusTape Jr.
Richmond Newspapers, Richmond, Va.	PDP-8
Trenton Times, Trenton, N.J.	CDC 8090
Winchester Evening Star, Winchester, Va.	JusTape
Fairchild Phototextsetter 2000	
Coronel Jose Garcia Valseca, Guadalajara, Mex.	Fairchild Comp/Set
Monumental Ptg. Co., Baltimore, Md.	Fairchild Comp/Set
Trade Composition Co., Springfield, Mass.	Fairchild Comp/Set
Intertype Fototronic	
Core Laboratories, Dallas, Tex.	Honeywell H-200
Dallas Times-Herald, Dallas, Tex.	IBM 1130
Drummond Business Forms, Drummondsville, Can.	Intertype 318C
Elkhart Truth, Elkhart, Ind.	PDP-8
Forest Grove News, Forest Grove, Oregon	PDP-8
Graphic Services, York, Pa.	PDP-8
W. F. Hall, Chicago	Honeywell H-200
Nieuwe Rotterdamse Courant, Netherlands	CDC 1700/8090
Seattle Times, Seattle, Wash.	IBM 1130
South Bend Tribune, South Bend, Ind.	IBM 1620—1130
Taylor Publishing Co., Dallas, Tex.	Honeywell H-200
Tooele Transcript, Tooele, Utah	PDP-8S
Western Printing & Litho, Poughkeepsie, N.Y.	IBM 1401

Intertype Fototronic CRT	
Baird-Ward Co., Nashville, Tenn.	IBM 360/30
Colonial Press, Clinton, Mass. (on order)	Honeywell H-120
Rocappi, Inc., Pennsauken, N.J.	RCA 301
West Publishing Co., St. Paul, Minn.	IBM 360/30
Mergenthaler Linofilm	
Aarhuus Stiftsbogtrykkeris A/S, Denmark	PDP-8
Avis, Svendborg, Denmark	PDP-8
Alkmaar Verenigde Noordhollandse Dagbladen, Netherlands	Philips
Boston Globe, Boston, Mass.	Honeywell H-1200
Catholic Register, Denver, Col.	RCA 301 IBM 1130
Computer Composition, Flourtown, Pa.	CDC 160A
Computer Graphics, Denver, Col.	IBM 1620
Corpus Christi Caller, Corpus Christi, Tex.	IBM 1130
Davenport Democrat, Davenport, Ia.	IBM 1130
Drukkerij Salland, Netherlands	Honeywell H-200
Druckerei Ernst Klett, Stuttgart, Ger.	IBM 1130
Flint Journal, Flint, Mich.	CDC 3300
Fyens Stiftstidende, Odense, Denmark	PDP-8
Hamilton Spectator, Hamilton, Can.	IBM 1130
Hawaii Newspapers Agency, Honolulu	IBM 1130
Inforonics, Inc., Maynard, Mass.	PDP-1
ITU Training Center, Colorado Springs, Col.	IBM 1130
Karlstad Nya-Wermlands-Tidningen, Sweden	IBM 1130
Kokomo Tribune, Kokomo, Ind.	IBM 1130
Lancaster Newspaper, Lancaster, Pa.	PDP-8
Madison Newspapers, Madison, Wisc.	IBM 1130
Metropolitan Printing Co., Elk Grove, Ill.	PDP-8
Mission Photocomposition, Merriam, Kans.	IBM 1130
Monterrey El Porvenir, Monterrey, Mex.	Linasec
Montreal Star, Montreal, Can.	IBM 1130 Linasec
Mt. Clemens Macomb Daily, Mt. Clemens, Mich.	Linasec
National Bureau of Standards, Washington, D.C.	Univac 1108
Newspaper Agency Corp., Salt Lake City, Utah	Honeywell H-200
Oakland Tribune, Oakland, Cal.	IBM 1130
Orlando Sentinel, Orlando, Fla.	NCR 315
Ottawa Citizen, Ottawa, Ont., Can.	IBM 1130
Parkersburg Sentinel, Parkersburg, W. Va.	PDP-8
Philadelphia Inquirer, Philadelphia, Pa.	Fairchild Comp/Set
Pittsburgh Press & Post-Gazette, Pittsburgh, Pa.	IBM 1130
Quebec Le Soleil, Quebec, Can.	Univac 1107 Intertype 300
Rocky Mountain News, Colorado	IBM 1130
St. Petersburg Times, Fla.	Honeywell
San Francisco Newspaper Prtg. Co., San Francisco	IBM 1130—360/30
San Jose News, San Jose, Cal.	IBM 1401—1130
San Mateo Times, San Mateo, Cal.	IBM 1130

Santa Monica Outlook, Santa Monica, Cal.	IBM 1130
Southwest Typo, Dallas, Tex.	IBM 1130
Tallahassee Democrat, Tallahassee, Fla.	JusTape
Tampa Tribune & Times, Tampa, Fla.	PDP-8
Toronto Star, Toronto, Can.	IBM 1130
Uniprint Glostrup, Denmark	IBM 1130
U.S. Gov. Ptg. Office	360/40/50
Washington Evening Star	IBM 1130
Waterbury Republic, Waterbury, Conn.	IBM 1130
Wheeling Intelligencer, Wheeling, W. Va.	PDP-8
Wisconsin State Ptg., Madison, Wisc.	IBM 360
WPAFB Ptg. Div., Wright Patterson AF Base, O.	IBM 709/7080

Mergenthaler Linofilm Quick

Acme Ptg., Medford, Mass.	IBM 1130
Beaver Falls Tribune, Beaver Falls, Pa.	JusTape
Bowling Green News, Bowling Green, Ky.	JusTape
Burlington Free Press, Burlington, Vt.	JusTape
Daytona Beach News, Daytona, Fla.	JusTape
Fayetteville Observer, Fayetteville, N.C.	JusTape
Ford Motor Co., Dearborn, Mich.	JusTape
Foster's Democrat, Dover, N.H.	PDP-8
Fotocomposition, S.A. Mexico, D.F.	Intertype 219T
Helsinki Sanoma, Finland	IBM 1130
Johnstown Tribune-Democrat, Johnstown, Pa.	JusTape
Wm. J. Keller, Buffalo, N.Y.	Linasec
Keys Ptg. Co., Greenville, S.C.	JusTape
Kittanning Leader-Times, Kittanning, Pa.	IBM 1130
Kokomo Tribune, Kokomo, Ind.	IBM 1130
Kutztown Publishing Co., Kutztown, Pa.	JusTape
Lane Press, Burlington, Vt.	IBM 1130
Metropolitan Ptg., Elk Grove, Ill.	PDP-8
	JusTape
Montevideo La Manana, Uruguay	JusTape
Moline Daily Dispatch, Moline, Ill.	JusTape
Morton Newspapers, Armagh, Ireland	PDP-8
Oshkosh Northwestern, Oshkosh, Wis.	JusTape
Parrett & Neves, Sittingbourne, Eng.	PDP-8
Photo Data, Washington, D.C.	IBM 1130
Photo Printers, Peterborough, Eng.	JusTape
Poole Brothers, Chicago, Ill.	IBM 1620
H. G. Roebuck, Baltimore, Md.	Linasec
St. Johns Telegram, St. Johns, Newfoundland	JusTape
Salisbury Post, Salisbury, N.C.	JusTape
San Juan Star, San Juan, Porto Rico	JusTape
	Linasec
So. New England Typo Services, Hamden, Conn.	IBM 1130
Tallahassee Democrat, Tallahassee, Fla.	JusTape
Tower Typesetting, Chicago	Linasec
University of Washington, Seattle, Wash.	Burroughs 5500
Vail-Ballou Press, Binghamton, N.Y.	Linasec

Waukesha Freeman, Waukesha, Wisc.	JusTape
Williams Press, Chicago Heights, Ill.	JusTape
Williamsport Sun-Gazette, Williamsport, Pa.	JusTape
World Graphics, West Caldwell, N.J.	JusTape

Mergenthaler Linotron 505

Black Dot Phototypesetting, Crystal Lake, Ill.	SDS Sigma 2
H. M. Stationery Office, London, Eng.	IC Ltd. 1904
Mission Photocomposition, Merriam, Kans.	IBM 1130
Portsmouth News, Portsmouth, Eng.	IC Ltd. 1901
Washington Evening Star, Washington, D.C.	IBM 1130

Mergenthaler Linotron 1010

Automatech Graphics, New York	IBM 360/40
U.S. Air Force Logistics, Dayton, O.	(?)
U.S. Gov. Ptg. Office, Washington, D.C.	IBM 360/40/50

Monophoto

Almqvist & Wicksell, Uppsala, Sweden	IC Ltd. 1901
American Typesetting, Chicago	IBM 1130
Jolly & Barber, Rugby, Eng.	Guttinger GSA
Studer Printers, Geneva, Switz.	Guttinger GSA

Photon Model 200

Alameda Times-Star, Alameda, Cal.	Linasec 11
American Chemical Society, Washington, D.C.	IBM 360/30/40
American Mathematical Society, Providence, R.I.	IBM 1130
E.C. Art Publishers, Chicago	IBM 1130
Auto-Graphics, Monterey Park, Cal.	RCA Spectra 70/35
Bergen Evening Record Corp., Hackensack, N.J.	IBM 1130
Boston Herald Traveler, Boston, Mass.	Linasec 11
Canton Repository, Canton, O.	IBM 1130
Datagraphics, Chicago	IBM 360/30 IBM 1401/1410
Dow Jones & Co., Highland, Ill.	PDP-8
Greater Buffalo Press, Buffalo, N.Y.	IBM 1130
Harrisburg Patriot-News, Harrisburg, Pa.	PDP-8
Hayward Daily Review, Hayward, Cal.	PDP-8
Jacksonville Times-Union, Jacksonville, Fla.	IBM 1130
Johnstown Tribune Democrat, Johnstown, Pa.	JusTape
Lawrence Eagle Tribune, Lawrence, Mass.	JusTape
Lorain Journal, Lorain, O.	IBM 1130
Mansfield News Journal, Mansfield, O.	IBM 1130
Mid-America Web Offset, Omaha, Neb.	Honeywell H-200
Norfolk Virginian, Norfolk, Va.	IBM 1130
Portland Oregonian, Portland, Ore.	CDC
Quincy Patriot-Ledger, Quincy, Mass.	Linasec 11
Regency Thermographics, Waynesboro, Pa.	IBM 1130
Syracuse Herald-Journal, Syracuse, N.Y.	IBM 1130
Tarentum Valley Daily News, Tarentum, Pa.	PDP-8

Time, Inc., New York	RCA Spectra 70/45
U.S. Dept. of Defense, National Security Agency, Washington, D.C.	Univac
U.S. Dept. of the Interior Geological Survey, Washington, D.C.	IBM 360/30
Warren Tribune-Chronicle	PDP-8
West Palm Beach Post Times, W. Palm Beach, Fla.	Spectra 70
Windsor Star, Windsor, Ont., Can.	Linasec

Photon Model 513

**Athens Banner-Herald, Athens, Ga.	IBM 1130
**Augusta Chronicle-Herald, Augusta, Ga.	IBM 1130
Beloit News, Beloit, Wisc.	IBM 1130
Central Intelligence Agency, Washington, D.C.	IBM 360/65
Columbia State Record, Columbia, S.C.	IBM 1130
Columbus Citizen-Journal, Columbus, O.	IBM 1130
Columbus Dispatch, Columbus, Ohio	IBM 1130
Elyria Chronicle-Telegram, Elyria, O.	IBM 1130
*Leesburg Commercial, Leesburg, Fla.	RCA Spectra 70
Les Publications Associees, Granby, Quebec	IBM 1130
Mansfield News-Journal, Mansfield, Ohio	IBM 1130
*Melbourne Times, Melbourne, Fla.	RCA Spectra 70
Montreal Dimanche-Matin, Montreal, Can.	IBM 1130
*Ocala Star-Banner, Ocala, Fla.	RCA Spectra 70
Oklahoma City Times, Okla. City	IBM 1130
*Panama City News-Herald, Panama City, Fla.	RCA Spectra 70
*Pensacola News-Journal, Pensacola, Fla.	RCA Spectra 70
Perry Publications, West Palm Beach, Fla.	RCA 301/Spectra 70
*Playground Daily News, Ft. Walton Beach, Fla.	RCA Spectra 70
Richmond Newspapers, Richmond, Va.	PDP-8
**Savannah News-Press, Savannah, Ga.	IBM 360/1130
Southeastern Newspapers, Augusta, Ga.	IBM 1130
Southtown Economist, Chicago	IBM 1130
Tucson Star & Citizen, Tucson, Ariz.	PDP-8
Warren Tribune-Chronicle, Warren, O.	PDP-8
*West Palm Beach Post Times, West Palm Beach, Fla.	RCA Spectra 70

* Perry Publications, Inc.
** Southeastern Newspapers Corporation

Photon Model 540

Druckerei Ernst Klett, Stuttgart, Ger.	IBM 1130
Kingsport Press, Kingsport, Tenn.	IBM 1130
Norrkoping Tidningar Ostergotlands, Sweden	Fairchild Comp/Set

Photon Model 560

Akron Beacon-Journal, Akron, O.	IBM 1130
Bergen Evening Record, Hackensack, N.J.	IBM 1130
Billings Gazette, Billings, Mont.	IBM 1130
Burlington County Times, Willingboro, N.J.	IBM 1130
Computer Photocomp, Kansas City, Mo.	IBM 1130

Copley Press, La Jolla, Cal.	IBM 1130
Cumberland Newspapers, Carlisle, Eng.	PDP-8
Datagraphics, Chicago	IBM 1401/1440
Dewberry Engraving, Birmingham, Ala.	PDP-8S
R.R. Donnelley & Sons, Chicago	IBM 360/40
	GE 415
Erie Times-News, Erie, Pa.	IBM 1130
Hayward Review, Hayward, Cal.	PDP-8
Madison Newspapers, Madison, Wisc.	IBM 1130
Miami Herald, Miami, Fla.	IBM 1620
New Haven Register, New Haven, Conn.	IBM 1130
Paddock Publications, Arlington Heights, Ill.	PDP-8
Rock Hill Herald, Rock Hill, S.C.	PDP-8
Sacramento Union, Sacramento, Cal.	IBM 1130
Sunnyvale Standard, Sunnyvale, Cal.	IBM 1130
Trenton Times, Trenton, N.J.	IBM 1130
	CDC 8090
University of Pittsburgh, Pittsburgh, Pa.	IBM 709/7000
Walnut Creek Contra Costa Times, Cal.	IBM 1130
	JusTape
Western Electric Co., Winston-Salem, N.C.	RCA Spectra 70/25
	RCA Spectra 70/45

Photon 713 Textmaster

Alameda Times-Star, Alameda, Cal.	Linasec
American Charts Co., Atlanta, Ga.	Burroughs 263
American Chemical Society, Washington, D.C.	IBM 360/30/40
American Mathematical Society, Providence, R.I.	IBM 1130
**Athens Banner-Herald, Athens, Ga.	IBM 1130
**Augusta Chronicle-Herald, Augusta, Ga.	IBM 1130
Auto-Graphics, Monterey Park, Cal.	RCA Spectra 70/35
Beloit News, Beloit, Wis.	IBM 1130
A. Bernhard & Co., New York	RCA Spectra 70/45
Bianco Bogtrykkeri, Copenhagen, Den.	IBM 1130
Billings Gazette, Billings, Mont.	IBM 1130
Bristol Ptg. Co., Levittown, Pa.	IBM 1130
Bureau of National Affairs, Washington, D.C. (Bru-El Graphic, Bailey's Crossroads, Va.)	Honeywell H-200
Burlington County Times, Willingboro, N.J.	IBM 1130
Burlington Free Press, Burlington, Vt.	JusTape
Central Intelligence Agency, Washington, D.C.	IBM 360/65
Central Typesetting, San Diego, Cal.	PDP-8
Richard Clay, Bungay, Eng.	Elliott 903
	Linasec
Computer Photo-Typesetting, Mt. Rainier, Md.	IBM 1130
Copley Press, La Jolla, Cal.	IBM 1130
Dewberry Engraving Co., Birmingham, Ala.	PDP 8-S
Dittler Bros., Atlanta, Ga.	IBM 1130
Documentation Inc. (Leaseco), Bethesda, Md.	IBM 1401/1410
Dow Jones, Highland, Ill.	IBM 1130
East Midland Photo Printers, Petersborough, Eng.	IC Ltd., 1901
EDP Data Centre, Toronto, Can.	Honeywell H-200

Edwards Bros., Ann Arbor, Mich.	IBM 1130
El Dorado News-Times, El Dorado, Ark.	JusTape
Foster's Democrat, Dover, N.H.	PDP-8
Fotocomp, New York	PDP-8
Galveston News, Galveston, Tex.	JusTape
Graphic Arts Data Service (Cuneo), Chicago	RCA 301
Greater Buffalo Press, Buffalo, N.Y.	IBM 1130
Graphic Image, Chicago	IBM 1130
Herald Press, Pawtucket, R.I.	PDP-8
Herald Pub. Co., Rock Hill, S.C.	PDP-8
Hudson Register-Star, Hudson, N.Y.	JusTape Jr.
International Computaprint, Ft. Washington, Pa.	RCA Spectra 70/45
International Printers, London, Eng.	IC Ltd. 1900
ITU Training Center, Colorado Springs, Col.	IBM 1130 JusTape
Jackson Typesetting Co., Jackson, Mich.	Fairchild Comp/Set
Karlstad Nya-Wermlands-Tidningen, Sweden	IBM 1130
Mack Ptg. Co., Easton, Pa.	Honeywell H-200
Malmo Arbetet, Sweden	IBM 1130
March Photo, New York	PDP-8
Marietta Times Journal, Marietta, Ga.	IBM 1130
Martins Ferry Times Leader, Martins Ferry, O.	Intertype 318-C
Mennonite Pub. House, Scottdale, Pa.	IBM 1130
Minute-Man Publications, Lexington, Mass.	JusTape
McLean Brothers, Montreal, Can.	IBM 1130
Mid-American Ptg. Co., St. Louis	IBM 1130
Mid-America Web-Offset, Omaha, Neb.	Honeywell H-200
Missoulian Sentinel, Missoula, Mont.	IBM 1130
Montreal Offset, Montreal, Can.	IBM 1130
National Engraving Co., Birmingham, Ala.	PDP 8-S
National Security Agency, Washington, D.C.	Univac
Nebraska Publishing Co., Lincoln, Neb.	Honeywell H-200
News Ptg. Co., Tarentum, Pa.	PDP-8
Norrkoping Tidningar Ostergotlands, Sweden	Fairchild Comp/Set
North Shore Pub. Co., Wilmette, Ill.	Linasec II
Pawtucket Herald, Pawtucket, R.I.	PDP-8
*Perry Publications, West Palm Beach, Fla.	RCA Spectra 70
Photo-Comp, Encino, Cal.	IBM 360/40
Photo Image, Chicago	PDP-8
Poly-Tech Industries, Detroit, Mich.	IBM 1130
Queensland Newspapers, Brisbane, Aus.	PDP-8
Reading Evening Post, Reading, Eng.	Elliott 903
Richardson, Bond & Wright, Owen Sound, Can.	IBM 1130
Richmond Newspapers, Richmond, Va.	PDP-8
Rocappi, Inc., Pennsauken, N.J.	RCA 301
Rock Hill Herald, Rock Hill, S.C.	PDP-8
Sacramento Union, Sacramento, Cal.	IBM 1130
**Savannah News-Press, Savannah, Ga.	IBM 1130/360
Science Press, Ephrata, Pa.	Honeywell H-200
J. Shuler Co., Buffalo, N.Y.	Honeywell H-200
Southeastern Newspapers, Augusta, Ga.	IBM 1130

Southwark Offset, London, Eng.	IC Ltd. 1901
Sunnyvale Standard, Sunnyvale, Cal.	IBM 1130
Thompson Organization, Hemel Hempstead, Eng.	Elliott 903
C. Tinling, Prescot, Eng.	Elliott 903
Travelers Insurance Co., Hartford, Conn.	IBM 360/40
Turan Sanomat, Finland	IBM 1401/360/30
Tweddle Litho, St. Clair Shores, Mich.	Honeywell H-120
Vineland Times-Journal, Vineland, N.J.	PDP-8
Washington Post, Washington, D.C.	IBM 1130
Web Offset Publications, Toronto, Can.	IBM 1130
Westminster Press, London, Eng.	PDP-8
Wellington-Attas, Bergenfield, N.J.	PDP-8
Wooster Record, Wooster O.	Intertype 318-C
Zanesville Pub. Co., Zanesville, O.	Linasec II

*Perry operates Photon equipment at Melbourne, Panama City, Pensacola, and West Palm Beach (all in Florida). The equipment consists of six Photon 513's and 8 Photon 713's.

**Southeastern Newspapers Corp.

Photon ZIP (900-Series)

J. W. Clement Co., San Francisco, Cal.	IBM 360/30/40
Computaprint, Ltd., London, Eng.	Univac 418
General Motors Photographic, Detroit, Mich.	IBM 709/7000 Honeywell H-200
Latham Process Corporation, New York	None
National Library of Medicine, Bethesda, Md.	Honeywell H-800
New York Telephone Co., New York	RCA Spectra 70/35/45 RCA 301/501
Phillips & Van Orden, San Francisco	IBM 360/30
Sedgwick Printout Systems, New York	None
U.S. Dept, of Defense, Washington, D.C.	Univac

Hell Digiset (Videocomp)

Haarlemse Diepdruk, Netherlands	Hellcom
Lumo-Zet, Amsterdam, Netherlands	Philips
Lux-Bildstudio, Neu-Isenburg, Ger.	Hellcom
Nuernberger Nachtrichten, Germany	Hellcom
Axel Springer, Hamburg, Ger.	Siemens/Hell

Note: This information is largely derived from the publications and summaries of Composition Information Services, and we acknowledge with gratitude their permission to use their material. Supplemental information has been derived from certain suppliers. This writer has made no effort to verify the facts with the firms involved. If there are errors, however, they are not to be attributed to our sources, since it is possible that we are responsible for them.

RCA VIDEOCOMP INSTALLATIONS

Poole Brothers Chicago	822 833-155	Spectra 70/45	1/67 9/68
Videographic Systems, Inc. Hauppauge, Long Island	822 832 (2 on order)	Spectra 70/45	3/67
Dow Jones South Brunswick, N.J.	821	IBM 360	5/67
Michigan Typesetting Co. Detroit, Michigan	822 832-270 on order	Spectra 70/35	7/67
Computype St. Paul, Minn.	822 832-270 on order	IBM 360	9/67
McCall Corp. Princeton, N.J.	822	Spectra 70/45	10/67
Time, Inc. Springdale, Conn.	822 x 5/68	IBM 360	10/67
Auto Graphics Menlo Park, Cal.	822 832-270 on order	Spectra 70/35	11/67
R. R. Donnelley Chicago	833-155	IBM 360	4/68
Commonwealth of Penna. Harrisburg	822		5/68
A. Bernhard & Co. New York	822 832 on order	Spectra 70/45	8/68
International Textbook Scranton (Haddon)	822	Spectra 70/35	8/68
Omega Data Systems (Compucomp) New York	822 832 on order	Spectra 70/45	10/68
Commerce Clearing House Chicago	822	IBM 360 (?)	10/68
Arcata National Corp. Menlo Park, Cal.	822		1/69

APPENDIX II

SOME INFORMATION PROJECTS

The amount of attention given to information processing at the present time is dramatically highlighted by the National Science Foundation Report No. 14, entitled "Current Research and Development in Scientific Documentation". This 600 page book contains an exhaustive listing of research projects (many of them financed by NSF grants) covering, among other things:

> Information needs and uses, including activities in this area by the American Documentation Institute, the American Psychiatric Association, the Federation of American Sciences for Experimental Biology (FASEB) and many others.

A typical program is the FASEB information project, whose purpose was to make available in English leading articles in foreign (especially Russian) journals. "Between July 1, 1962 and March 31, 1965 there have been 18,033 articles reviewed. Of these, 2,820 were selected for translation. A total of 774 were published in the *Federation Proceedings* and 2,000 papers translated but not published were listed in *Federation Supplement* and deposited for order through the Clearing House for Federal Scientific and Technical information.

George Washington University has conducted a project to "examine and facilitate the flow of information generated among the several programs in space biology".

Information Dynamics has been working on a project for a nationwide scientific network.

The National Research Council of the National Academy of Sciences has carried on a project to determine what would be the relative use of Defense Department Information centers by government, industry and the universities.

The National Agricultural Library has had a project "ABLE" (Agriculture-Biological Literature Exploitation) to analyze the possibility of applying automation to library services and to determine requirements of USDA Scientists for access to publications and library services.

Northwestern University has had a project on "Infor Search-Operational Experiments" and Rutgers on the "Nature and Scope of Work in Information Centers".

Yale University has sponsored a study "to seek to discover the statistical relationship among scientific papers as evidenced by their linkages in citation networks".

These are only a few illustrations of studies in the area of information needs and uses. A second area of research was identified in this NSF publication as "Document Creation and Copying" and it includes reference to a computer editing system under development by the Bell Laboratories, text editing programs by the University of Pittsburgh, as well as "Research in Automatic Photo Composition and Information Dissemination", while Documentation Inc. has had among its projects "a system for rapidly designing new indexing-type page formats for phototypesetting devices driven by digital computers". The Research Analysis Corporation has a study on automated documentation and the University of Rochester on "determination of acceptable minimum of information in abbreviated scientific journal citations".

Language analysis, machine translation, abstracting, classification, coding and indexing, system design of information centers and information retrieval as well as artificial intelligence and problem solving systems are among other areas in which research is reported. Here are a few topics:

"To establish an economical and effective computer-based system for current awareness notification and retrospective searching both for library information and/or information files of scientists and information centers".

"The design of an adequate reference retrieval system for physicists".

"To examine existing methods of legal text searching to develop a fully-automated method for indexing and searching".

Project LITE (Legal Information Through Electronics) is under development by the United States Air Force.

A program for medical information handling.

To develop and produce a computer-oriented information storage and retrieval system for the Bureau of Ships Technical Training Library.

Other similar projects include GRASP (Generalized Retrieval and Storage Program), SMART (Salton's Magical Automatic Retriever of Texts), ALPHA (Automated Literature Processing, Handling and Analysis), GIRSS (General Information Retrieval System Simulation), HAYSTAQ (chemical information retrieval system), INTREX (Information Transfer Experiments) and TAXON (numerical taxonomic analysis).

GOVERNMENT INFORMATION CENTERS

Ballistic Missile Radiation Center, University of Michigan, Ann Arbor
Batelle-Defender Information Analysis Center, Columbus, O.
Ceramics and Graphite Information Center, Wright-Patterson Air Base, Ohio
Chemical Propulsion Information Agency, The Johns Hopkins University, Silver Spring, Md.
Counterinsurgency Information Analysis, Special Operations Research Office, Washington, D.C.
DASA Data Center, General Electric Co., Santa Barbara, Cal.
Defense Metals Information Center, Batelle Memorial Institute, Columbus, O.
Electronic Properties Information Center, Hughes Aircraft Co., Culver City, Cal.

Hibernation Information Exchange, Office of Naval Research, Chicago
Human Engineering Information and Analysis Center, Tufts University, Medford, Mass.
Infrared Information Analysis Center, University of Mich., Ann Arbor
Mechanical Properties of Metals, Belfour Engineering Co., Traverse City, Mich.
Military Entomology Service, Walter Reed Army Medical Center, Wash., D.C.
National Oceanographic Center, Navy Yard Annex, Washington
Nondestructive Testing Information Center, U.S. Army Materials Research Agency, Watertown, Mass.
Nuclear Safety Information Center, Oak Ridge National Laboratory, Oak Ridge, Tenn.
Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N.J.
Radiation Effects Information Center, Batelle Memorial Institute, Columbus, O.
Remote Area Conflict Information Center, Batelle Memorial Institute, Columbus, O.
Shock and Vibration Information Center, U.S. Naval Research Laboratory, Washington, D.C.
Thermophysical Properties Research Center, Purdue University, Lafayette, Ind.
Vela Seismic Information and Analysis Center, U. of Mich., Ann Arbor

Atomic Energy Commission Information Analysis Centers:
- Argonne Code Center—Digital computer codes: nuclear physics, reactor design, reactor engineering
- Atomic and Molecular Processes Information Center—Oak Ridge
- Charged Particle Cross Section Information Center—Oak Ridge
- Information Center for Internal Exposure—Oak Ridge
- Isotopes Information Center—Oak Ridge
- Man-made Radiation in the Biosphere—Lawrence Radiation Laboratory, Livermore, Cal.
- Nuclear Data Project—Oak Ridge
- Radiation Chemistry Data Center—U. of Notre Dame, South Bend, Indiana
- Reactor Physics Constants Center, Argonne, Ill.
- Research Materials Information Center, Oak Ridge
- Scientific Information Systems Group, Lawrence Radiation Laboratory, Livermore, Cal.
- Sigma Center, Brookhaven National Laboratory, Upton, Long Is.
- Thermodynamic Properties of Metals and Alloys, University of California, Berkeley, Cal.

The State Technical Services Act (passed Sept. 14, 1965)

$60 million in federal grants to states wishing to set up technical information services. States must match federal funds.

States will administer programs through a regional or state center in conjunction with land grant colleges, business administration schools, technical schools, and universities.

APPENDIX III

BIBLIOGRAPHY

Advances in Computer Typesetting, *Proceedings of the 1966 International Computer Typesetting Conference,* Institute of Printing, London, 1967.

American Mathematical Society, *Development of Computer Aids for Tape-Control of Photocomposing Machines* (National Science Foundation Grant GN-533)

Report No. 1, March, 1967: Mechanization of Mathematical Reviews Office Procedures

Report No. 2, July, 1967: Extension of the system of preparing a computer-processed tape to include the setting of multiple line equations

Final Report, Section A, August 1968: Mechanization of Mathematical Reviews Office Procedures

Final Report, Section B, August, 1968: A system for computer-processed tape composition to include the setting of multiple line equations

Final Report, Section C, January, 1969: Implementation, Hardware and other systems

American Mathematical Society, Providence, R.I.

American Newspaper Publishers Assn. Conference, *Summary of Contents of Bell System Presentation,* American Newspaper Publishers Assn. Conference, Washington, D.C., June 13, 1968.

American University Symposium, *Printing and Publishing: Management of Automation* (Papers from the 1967 Symposium), Composition Information Services, Los Angeles.

Andersson, P. L., *Interrelated Technologies and Systems* (A Collection of Particularly Important Papers Presented at an American University Institute, Washington, D.C., January 15-17, 1968), Composition Information Services, Los Angeles.

Andersson, P. L., *Survey of Computers,* Penton Publishing Co., Cleveland, 1965.

A.N.P.A. Research Institute, *All-Digital Newspaper Page Facsimile Tests at the ANPA/RI Research Center,* R.I. Bulletin No. 949, Easton, March 18, 1968.

A.N.P.A. Research Institute, *Front Page Transmitted by Facsimile from London to Puerto Rico in Less than 12 Minutes,* R.I. Bulletin 935, Easton, Oct. 30, 1967.

A.N.P.A. Research Institute, Inc., *Time-sharing and the Newspaper of Tomorrow,* R.I. Bulletin No. 951, Easton, April 15, 1968.

Astrotype, *Advertising Brochure,* 109 East Madison Ave., Ann Arbor, Mich., 48104.

Author's Alterations: Are They Really Necessary?
Publishers' Weekly, April 5, 1965, Reprinted by Composition Information Services, Los Angeles.

Automation and Electronics in Publishing (Based on American University Symposium, January, 1965), Spartan Books, Inc., Washington, D.C., 1966.

Autoscript Computer Typesetting System, tr. from Grafiskt Forum (Stockholm) No. 1, 1967, reprinted by Composition Information Services, Los Angeles.

Barnett, Michael P., *Computer Typesetting, Experiments and Prospects,* The MIT Press, Massachusetts Institute of Technology, Cambridge, Mass. and London, 1965.

Berkwitt, G., *Printed Word: It's What's Happening,* Dun's Review, July, 1968 pp. 67-70.

Big Picture of a Changing Industry, Printing Production, June, 1968, p. 70-71.

Book Production Magazine Special Report, *Computers Are Here: What Now? Their Impact on Book Composition,* Reprinted from Book Production Magazine, Feb., Mar., Apr., May, 1964.

Brown, Dwight D., *The Computer's Spreading Power in Printing,* Printing Production, June, 1968.

Brown, W. S. and others, *Future of Scientific Journals,* Science, Feb. 9 (p. 582), Mar. 22 (p. 1305), Apr. 12 (p. 209), 1969.

Bruno, Michael H., *Automation Speeds Ahead,* Inland Printer, January, 1969 p. 29 ff.

Call 360/Datatext Quick Reference Guide, Data Processing Division, International Business Machines Corporation, Information Marketing Dept., White Plains, New York.

Chisholm, Alister, *The Case for Revising the Layout of Typesetting Perforator Keyboards,* British Printer, Oct., 1968.

Composition Information Services, *CIS Analysis of Phototypesetting Systems,* Composition Information Services, Los Angeles, 1969.

Composition Information Services, *Glossary of Automated Typesetting & Related Computer Terms,* Composition Information Services, Los Angeles, 1966.

Composition Information Services, *Index to biweekly editions of the CIS Newsletter,* 1964, 1965, 1966, 1967 and 1968, Composition Information Services, Los Angeles.

Composition Information Services, *Justifying and Non-Justifying Tape Perforators,* Composition Information Services, Los Angeles, 1968.

Composition Information Services, *A Management Report on the State of the Art,* Composition Information Services, October, 1964.

Computer-Aided Typesetting and Phototypesetting, EURATOM, Belgium, 1966.

Computer Set: The Elliott-Thomson Computer Typesetting System, Release by C.I. Cowan, Computer Typesetting Dept., Snientific Computing Division, Elliott-Automation, Ltd., Borehamwood, Herts., England, May, 1965.

Computer Typesetting: A Select Bibliography, Watford College of Technology, Hempstead Roads, Watford, Herts., Eng.

Computer Composition Users on Sharp Rise, Book Production Industry, Jan., 1969.

Computer System at The Times Will Give Information to Public, New York Times, March 27, 1969.

Computer Typesetting Conference Proceedings, London University, July, 1964, Published by the Institute of Printing, Ltd., London, 1965.

Cope, Robert, *Electronic Composition—A New Dimension in Typesetting,* Undated reprint by Composition Information Services, Los Angeles.

Copy Reading Machine Linked with Computer, Editor and Publisher, Dec. 26, 1964.

Corley, Francis C., *Guttinger GSA Monotron/Monotype Case History,* Presented at the Character Generation Seminar, Printing Industries of America Computer Section, Chicago, May 19, 1967, reprinted by Composition Information Services, Los Angeles.

Corstius, H. B. (Amsterdam), *First Trials of Calcomp Plotter,* Reprinted by Composition Information Services, Los Angeles (undated).

Cuba, E., *Cathode-Ray Tube Photo Typesetting System,* see *Advances in Computer Typesetting,* p. 223-225.

The Data Bank: What is it and how would you operate it? Book Production Industry, February, 1969, p. 67 ff.

David, E. E., Jr. (Bell Telephone Laboratories), *Data Communications for Newspapers for today and tomorrow,* Unpublished paper, American Newspaper Publishers' Assn. conference, Washington, D.C., June 13, 1968.

Direct Image Composition (Typography's New Partner), Western Printer & Lithographer, Feb., 1968.

Doebler, Paul D. and Jules S. Tewlow, *The Shape of the Future, II,* Book Production Industry, Jan., 1967.

Donnelley Installs Videocomp System for Electronic Graphics, Publishers' Weekly, Nov. 4, 1968, p. 92 ff.

Duncan, C. J., *Editing and Proofreading for Computers and Processed Books,* Book Production Industry, Sept., 1965, pp. 62-63.

Duncan, C. J., *Illustrations Prepared for Lecture by C. J. Duncan for British Federation of Master Printers Annual Congress, Torquay, May 31, 1965.* Unpublished papers.

Duncan, C. J., *Look! No Hands!* Penrose Annual, Vol. 57, 1964, pp. 121-167.

Duncan, C. J., *Report (for six months ended 30 June, 1968),* Computer Typesetting Research Project, University of Newcastle, England.

Eckley, Frederick R. (A.T.&T.), *The World of Communications Today,* (Remarks at Convention of Printing Industries of America, New York, Sept. 21, 1965). Excerpts reprinted by Composition Information Services.

Electronic Composing System: A Guide for its Utilization, U.S. Govt. Ptg. Office, Washington, D.C., 0-797-612 (undated).

Electronics and Books: Merger Path, The New York Times, Feb. 6, 1966.

Fall Joint Computer Conference Proceedings (Computers and Publishing Session), Spartan Books, Inc., Washington, D.C., 1966.

Fano, R. M. and F. J. Corbato, *Time Sharing and Computers,* Scientific American, Sept. 1966.

Fischer, Margaret T. (Director, Information Handling Project, Time Inc.), *Information Systems Research and Development.* Unpublished paper presented at American University's Center for Technology and Administration Institute on Management and Technology in Printing and Publishing, January 13-15, 1969.

Gardner, Arthur E., *Goals for Graphic Arts Education* (Presented at the 1968 International Graphic Arts Education Association Conference, California State Polytechnic College, August 19, 1968). Undated reprint by Composition Information Services, Los Angeles.

Gardner, Arthur E., *The Typesetting Specialist in a New Generation,* Paper presented at the 48th convention of the International Typographic Composition Assn., Toronto, September 15, 1967, Composition Information Services, Los Angeles.

Getting Started in Computer Composition, Book Production Magazine, Sept., 1964.

Ginkel, J. van, *Experiences with the IBM 1130 Computer,* Paper presented at the 6th Technical Conference of F.I.E.J. in Paris, November, 1967 (Reprinted by Composition Information Services, Los Angeles).

Graphic Composing Techniques, RADC No. IDR 61-310, Final Report, Contract AF 30 (602)-2527, Thomas J. Watson Research Center, IBM Corp., Yorktown Heights, N.Y., Feb. 1, 1962.

Hattery, L. H. and G. P. Bush, *Automation & Electronics in Publishing,* Spartan Books, New York, 1965.

High Speed Composition by Computers, Printing Magazine/National Lithographer, Nov., 1963.

Hines, Theodore C. and Jessica L. Harris, *Computer Filing of Index, Bibliographic and Catalog Entries,* Bro-Dart Foundation, Newark, N.J., 1966.

How the Industry Will Change, Printing Production, June 1968, pp. 74-81.

IEEE Transactions in Engineering Writing and Speech, Institute of Electrical and Electronic Engineers, New York, 1968.

International Conference on Computerized Typesetting, (March 2-3, 1965), *Proceedings,* Research & Engineering Council of the Graphic Arts Industry, Washington, D.C.

Introducing TEXTRAN (Alphanumeric Textran), (Advertisement, Book Production Industry, February, 1969, pp. 28-29).

Jordan, Stello (Sperry Gyroscope Co.), *Electronic Data Storage, Retrieval and Revision Techniques Detailed to Illustrated Parts Breakdown and Provisioning Documentation Preparation,* Equipment Manual Symposium, co-sponsored by U.S. Army Material Command and American Ordnance Assn., Detroit, Nov. 30, 1965.

Kalagher, John J., *Micromation—Its Impact on the Photocomposing Industry,* Symposium on Electronic Composition, November 13, 1967. Reprinted by Composition Information Services, Los Angeles.

Kehl, W. B., *Computers and Literature,* Data Processing Magazine, August, 1965, pp. 24-26.

Kerr, B., *Revolution in Printing,* Saturday Review, Aug. 10, 1968, pp. 54-55.

Korman, N. I., *Some Remarks on the Potential for Automation in the Printing Industry.* (Speech at New York convention, Printing Industries of America, 1965), Composition Information Services, Los Angeles.

Kubelius, W., *Basic Guide to Computers for the Printing Industry,* Printing Magazine, June '64, p. 48-50.

Kuney, J. H., et al, *Encoding Manuscript as Primary Input to Chemical Information Handling Systems,* Am. Chem. Society, National Meeting Pittsburgh, Mar. 23-25, 1966 (Div. of Chem. Literature).

Kuney, J. H., B. G. Lazarchak and S. W. Walcavich (American Chemical Society), *Computerized Typesetting of Complex Scientific Material,* Fall Joint Computer Conference, 1966 (See *Proceedings*).

Kunkel, George E. (Central Intelligence Agency), *A Computer-Assisted Page Composing System,* Fall Joint Computer Conference, San Francisco, 1966.

Kunkel, George E. and Tilmon H. Marcum, *Hyphenless Justification,* Datamation, April, 1965, reprinted by Composition Information Services, Los Angeles.

Lamparter, William C., *Computerized Composition,* Reproductions Review, May, 1968.

Lannon, E. R., *Medlars,* see *Advances in Computer typesetting,* pp. 80-85.

Lanzendorfer, Max, *Buying Computerized Type Systems,* Printing Magazine, Feb., 1969, p. 96.

Lee, Richard W. and Roy W. Worral, *Electronic Composition in Printing* (Proceedings of a Symposium), National Bureau of Standards Special Publication 295. Feb., 1968, U.S. Department of Commerce.

Luhn, H. P., *Potentialities of Auto-Encoding of Scientific Literature,* IBM Research Center Research Report RC-101, May 15, 1959.

Littauer, C., *Composition by Nationwide Network,* Printing Magazine, Feb., 1969, pp. 80-81.

Makris, Constantine J., *Special Purpose Computer for High-Speed Page Composition,* Fall Joint Computer Conference, 1966 (See *Proceedings).*

Malt-Pitman Skills Analysis—Keyboard Training, *Results of Training Conducted in Tennessee, U.S.A., October, 1968,* Report issued by the Business Manager's Office, November 29, 1968, 46 Goodge St., London W1.

Management of Technological Change in Printing and Publishing, Papers presented at American University Symposium, Washington, D.C. 1968, Composition Information Services, Los Angeles.

Markus, John (Co-Chairman), *Highlights of AMA Conference on Computer Composition,* Unpublished document summarizing American Management Association conference, Feb. 14-16, 1966.

McCarthy, John, *Information,* Scientific American, Sept., 1966.

Mercer, V. S., F. E. Franklin and R. D. Lowenstein, *The Text 90 System,* Datamation, Oct., 1966.

Mergenthaler, *Linotron Delivered to Government Printing Office,* Manufacturer's News Release, reprinted by Composition Information Services, Los Angeles.

Melcher, Daniel, *Notes on author's alterations and the New Technology,* Publishers' Weekly, May 3, 1965, Reprinted by Composition Information Services, Los Angeles.

Meyer, Roland, *What Direction Tomorrow?* (Highlights of a paper presented at the Annual Convention of the Cold Type Composition Section, Printing Industries of America, in Chicago, June 22, 1968). Undated reprint by Composition Information Services, Los Angeles.

Minsky, Marvin L., *Artificial Intelligence,* Scientific American, Sept., 1966.

Mollman, P., *Programming CRT's First General Book,* Printing Magazine/National Lithographer, Oct., 1968.

Moran, James, *The Composition of Reading Matter,* Wace and Co., Ltd., London, 1965.

Moyer, Robert L., *Experiences in Keyboard Training,* Released by Composition Information Services, Los Angeles (undated).

Munn, Richard C., *Printing and Publishing Facsimile Applications,* Communications News, Aug., 1968.

National Bureau of Standards, *Automatic Typographic-Quality Typesetting Techniques: A State-of-the-Art Review,* U.S. Department Commerce, NBS Monograph 99, April 7, 1967. Supt. of Doc.

National Science Foundation, *Current Research and Development in Scientific Documentation,* National Science Foundation Report No. 14, Washington, D.C., 1966.

Nebel, B. E. (Los Angeles Times), *A Systems Approach to Computer Typesetting: Application of a Multiprogrammed Teleprocessing System,* Fall Joint Computer Conference, 1966 (See *Proceedings*).

New Computers Are Changing Printing Industry Techniques, Inland Printer/American Lithographer, June, 1964.

Oettinger, Anthony C., *Uses of Computers in Science,* Scientific American, Sept., 1966.

Overhage, Carl F. J., *Plans for Project Intrex,* Science, May 20, 1966, pp. 1032-1037.

Panullo, J. V., *New Computers Are Changing Printing Industry Production Techniques,* Inland Printer/American Lithographer, June, 1964, pp. 60-61.

Perry, J. H., Jr., *Applications of Computers & Optical Character Recognition Devices,* Proceedings of the 1966 International Computer Typesetting Conference, "Advances in Computer Typesetting" Institute of Printing, London, 1967.

Perry, John H., Jr., *Integrated Automation in Newspaper and Book Production. (See Fall Joint Computer Conference Proceedings), Fall Joint Computer Conference, San Francisco, 1966.*

Phillips, Arthur H., Computer Peripherals & Typesetting, Her Majesty's Stationery Office, London, 1968.

Preston, Keith, *The Mathset Computer Typesetting System* (Elliott-Automation Computers, Ltd., Borehamwood, Herts, England), Computer Weekly, Sept. 7, 1967, reprinted by Composition Information Services, Los Angeles.

Publishing in Non Print Media, Book Production Industry, Dec., 1968.

Publishing's Total Market, Book Production Industry March, 1969, p. 36 ff.

The Realities of Computerized Typesetting (Research & Engineering Council papers), Composition Information Services, Los Angeles, 1968.

Research and Engineering Council of the Graphic Arts Industry, *Proceedings, 13th Annual Conference, 1963,* Research and Engineering Council, Washington, D.C.

Research and Engineering Council of the Graphic Arts Industry, *Proceedings, Conference on Computerized Typesetting, 1967,* Composition Information Services, Los Angeles, 1968.

Rice, Stanley, *Planning for Computer Composition,* Publishers' Weekly, Feb. 24, 1969 p. 34-39.

Rice, Stanley, *What Happens When Designer Confronts Computer?* (see same article under "Planning for Computer Composition" in Publishers' Weekly), Book Production Industry March, 1969 p. 52-56.

Roth, Joel A., *CAI: Emerging Teaching Technique* (Computer-Aided Instruction), Book Production Industry, Jan., 1969.

Satenstein, H., *The Trouble With Computer Composition,* Book Production Industry, April 1966, p. 47.

Seybold, John W., *Aesthetic Considerations in Computerized Photocomposition,* Publishers' Weekly, April 7, 1969, p. 64-65.

Seybold, John W., *Between Here and Someday,* Automation and Electronics in Publishing, Spartan Books, Inc., Washington, D.C., 1966.

Seybold, John W., *Esthetic Values in Computerized Photocomposition,* Journal of Typographic Research, Vol II, No. 4, October, 1968, Cleveland.

Seybold, John W., *In Computer Typesetting, What Price Hyphenation?* Book Industry, Sept., 1964.

Seybold, John W., *Man-machine Relationships: Keyboarding, Proofreading, Programming,* Unpublished paper presented at Washington, D.C., American University Symposium, Jan. 1966.

Seybold, John W., *The Market for Computerized Composition,* A report to members of the Character Generation Committee of the PIA Computer Section (Restricted Circulation), Printing Industries of America Washington, D.C., October, 1966.

Seybold, John W., *Mechanized Procedures of Rocappi, Inc.,* LARC Report No. 14, Library Automation Research and Consulting Services, Denver, 1968.

Seybold, John W., *Progress Report from Rocappi, Inc.,* Conference on Computerized typesetting, March 2-3, 1965 (R & E Council), Composition Information Services, Los Angeles.

Seybold, John W., *Questionnaire for Computerized Composition Software Analysis,* Prepared in Collaborated with the Character Generation Committee, Printing Industries of America, Inc., Washington, D.C., 1968.

Seybold, John W., *Typographic Conventions for Computer-Related Transfer* (A Collection of Particularly Important Papers Presented at an American University Institute, Washington, D.C., January 15-17, 1968), Composition Information Services, Los Angeles.

Seybold, Jonathan W., *Cathode Ray Tube Typesetting Devices,* Printing Industries of America, Character Generation Sub-Committee, Computer Section, Washington, D.C., 1969.

Shatzkin, Leonard, *In-House Composition: Effects on Publishing* (Reprint), Publishers' Weekly, Oct. 7, 1968 p. 27-30.

Shatzkin, Leonard, *Some Effects of Computer Composition on the Editorial Process in Book Publishing,* Publishers' Weekly, April 7, 1969, p. 28-31.

Sherman, Don (Inforonics), *Computerized Typesetting of Complex Scientific Material,* Fall Joint Computer Conference, San Francisco, 1966 (See *Proceedings*).

Steckler, Phyllis B., *The Bowker Annual of Library and Book Trade Information,* R.R. Bowker, New York, 1968.

Stern, Michael M., *A Look at Typesetting Computers,* DI/AN Controls, Boston (undated).

Stevens, Mary Elizabeth and John L. Little, *Automatic Typographic-Quality Typesetting Techniques: A State-of-the-Art Review,* National Bureau of Standards Monograph No. 99 (Washington, D.C.: U.S. Government Printing Office, 1967).

Strauss, Victor, *Cameron's New Belt Press: Blank Paper to Bound Book in Two Minutes,* Publishers' Weekly, January 6, 1969, p. 58 ff.

Strauss, Victor, *In-House Tape Composition: Basic Considerations,* Publishers' Weekly, March 3, 1969, p. 78 ff.

Strauss, Victor, *Printing Image Carriers for Letter Press,* Publishers' Weekly, Feb. 3, 1969 p. 76 ff.

Strauss, Victor, *The Printing Industry,* Printing Industries of America, Inc., Washington, D.C. 1967.

Suppe, Patrick, *The Use of Computers in Education,* Scientific American, Sept., 1966.

TAGA, *Proceedings, 1965,* Technical Association of the Graphic Arts, Rochester, N.Y., 1965.

Tools for Teaching, Forbes, August 1, 1968.

Union Printers and Controlled Automation, Free Press division of Macmillan Co. New York, 1968.

Walcavich, S. and D. Sherman, *Typesetting by Computer,* Chemistry, July, 1968 p. 32-35.

Wellendorf, Dr.-Ing. Rudolf Hell, *Data Transmission in the Graphical Field* (A Collection of Particularly Important Papers Presented at an American University Institute, Washington, D.C., January 15-17, 1968), Composition Information Services, Los Angeles.

Where Printing Now Stands, Printing Production, June 1968, p. 72-73.

Wilson, R. A., *Optical Paper Reading Devices,* Reinhold, 1966.

APPENDIX IV

SAMPLES

List of Exhibits

Teacher Aids. Videocomp by Videographic Systems.
Stock Market report. Videocomp by Videographic Systems.
Livy concordance. Photon 901 by Sedgwick Printout Systems.
Listing of periodicals. Photon 901 by Sedgwick Printout Systems.
Industrial directory. Photon 901 by Sedgwick Printout Systems.
Book catalog. Photon 901 by Sedgwick Printout Systems.
Index Medicus. Photon 901 by Sedgwick Printout Systems.
Prentice-Hall case listings. Photon 901 by Sedgwick Printout Systems.
Institute for Scientific Information, Permuterm Index. Fototronic CRT by Rocappi, Inc.
Technical manual, showing updated material in bold italics. Photon 713 by Rocappi, Inc.
Technical manual, showing tabular and pagination manipulation. Photon 713 by Rocappi, Inc.
Church, State and Freedom. Linofilm by Rocappi, Inc.
Pages from "The Long Short Cut" produced on Videocomp at Videographic Systems, for Haddon Craftsmen. First novel paginated and set on high speed CRT system.
Cornell Alumni Directory, from supplied tape. Photon 713 by Rocappi, Inc. (alphabetic and geographic listings shown)
Alesco book catalog. Photon 713 by Rocappi, Inc.
Holt book catalog. Photon 713 by Rocappi, Inc.
College text. Photon 713 by Rocappi, Inc.
Index of Powder Diffractions, from supplied tape. Linofilm by Rocappi, Inc.
Smith, Kline & French drug listing. Two formats from same input, set on Photon 713 by Rocappi, Inc.
Viscosity Index. Calculations computed by program. Set ATF B-8 by Rocappi, Inc. in 1964.

How to Score High on the National Teacher Examination

Gruber, Edward C.

This text provides valuable assistance to teachers and prospective teachers preparing for the National Teacher Examination. All test areas are covered; optional specimen tests in business, education, home economics, industrial arts, mathematics, and music are included; and trial tests through which the applicant may increase proficiency and indentify areas of weakness are supplied along with three thousand NTE-type practice questions.

L/C No. 61-18929
© 1965; 1967 printing
7-7/8" x 10-1/4"; 282 pages

#1529 **LR cloth: $6.50**
#823 **paper: $4.00**

Early Childhood Education: Teaching Area Exam for the National Teacher Examination

For the college senior or graduate preparing for the National Teacher Examination in Early Childhood Education (grades K-3). Contains six sample tests patterned after recent NTE tests. Hundreds of questions and answers on psychology of literature, interpretation of poetry and prose, types of poetry and prose; pedagogy, dealing with English classroom situations; language and word study, including semantics, derivations, history of language; mechanics of English, embracing grammar, sentence structure, correct usage, punctuation. A supplementary study section gives rules governing verse, common figures of speech, synopses of Shakespeare's plays.

L/C No. 65-23055
© 1967
7-7/8" x 10-1/4"; 128 pages

#1608 **LR cloth: $5.50**
#1319 **paper: $3.95**

Mathematics: Teaching Area Exam for the National Teacher Exam

For college seniors or graduates preparing to take the National Teacher Examination in Mathematics, this book provides six complete sample tests closely paralleling actual exams. Mathematics areas covered are algebra, calculus, geometry, and trigonometry. General questions in the history and philosophy of education and in practical pedagogy are included.

L/C No. 67-18354
© 1968
7-7/8" x 10-1/4"; 96 pages

#1638 **LR cloth: $5.50**
#1639 **paper: $3.95**

	Per Share Earnings			Interim Per Share Earnings			Indic.	Approx. 1968 Price Range	Approx. Market	P/E Ratio Based on 1968 Est.	Current Yield
	1966	1967	1968 Est.	Period	1967	1968	Divd.				
Apparel (Continued)											
Gay Gibson (9/30) (OTC)	0.80	1.09	1.10	9 mos. Jun.	0.79	0.82	0.50	23-14	20	18.2	2.5
Hanes	2.40	1.95	2.40	6 mos. Jun.	0.75	0.94	0.90	45-24	40	16.7	2.3
Hart Schaffner & Marx (11/30)	2.52	2.53	2.65	9 mos. Aug.	1.92	2.04	1.10	61-45	56	21.1	2.0
Jonathan Logan	2.93	3.21	3.40	6 mos. Jun.	1.55	1.55	0.80	70-53	66	19.4	1.2
Koracorp (OTC) Δ	1.91	1.09	1.40	6 mos. Jun.	0.55	0.55	—	24-16	24	17.2	—
Manhattan Industries (1/31)	2.24†m	1.54†	2.50†	6 mos. Jul.	1.00	0.93	0.56s	36-20	30	12.0	1.9
xzPalm Beach (10/31) (OTC) Δ	1.13	1.27	φ	9 mos. Jul.	1.03	1.40	0.50	36-17	33	—	1.5
Phillips-Van Heusen	1.44	0.88	1.50	6 mos. Jun.	0.26	0.45	Stk.	27-17	27	18.0	—
Russ Togs "A" (1/31)	1.57†	1.78†	1.85†	6 mos. Jul.	0.79	0.71	0.60s	48-33	42	22.7	1.4
Siegel (H.I.) "A" (10/31)	2.36	1.44	1.60	9 mos. Jul.	1.33	1.24	0.68	29-17	25	15.6	2.7
zVanity Fair Mills	1.89	2.02	2.10	6 mos. Jun.	0.77	0.81	1.00	40-30	39	18.6	2.6
Villager (1/31)	1.53†	1.53†	2.00†	6 mos. Jul.	0.65	1.01	0.50	45-27	43	21.5	1.2
Warnaco	2.55	2.69	4.00	6 mos. Jun.	0.86	1.73	1.20	50-26	46	11.5	2.6
Beverage											
Coca-Cola--Non-Consolidated	1.56	1.76	1.90	3 mos. Mar.	0.35	0.40	1.20	81-62	72	37.9	1.7
--Consolidated	1.71	1.87	2.05	—	—	—	1.20	—	72	35.1	1.7
PepsiCo	1.83	1.88	2.05	24 wks. Jun.	0.80	0.85	0.90	52-37	46	22.4	2.0
Royal Crown Cola	1.43	1.29	1.35	6 mos. Jun.	0.81	0.77	0.72	46-26	39	28.9	1.8
Anheuser-Busch (OTC) Δ	1.50	1.64	1.90	6 mos. Jun.	0.69	0.85	0.80	71-40	70	36.8	1.1
Pabst Brewing (OTC) Δ	3.22	3.82	4.00	6 mos. Jun.	1.66	1.86	1.00u	98-61	98	24.5	1.0
Schlitz (Jos.) Brewing	1.80	2.02	2.30	6 mos. Jun.	0.96	1.08	1.20	63-35	63	27.4	1.9
Bacardi (OTC) Δ	3.63	4.27	4.90	6 mos. Jun.	1.72	2.48	2.20	100-57	100	20.4	2.2

Supplied by Videographic Systems Inc.

imperia accipienda essent neu quid nisi ducum iussu facerent; se in tempore editurum quae uellet agi. eadem ferme hora Tarentum fama praeuenerat 25 9 4
busta aliquantum intra moenia includunt. cum portae adpropinquaret, editus ex composito ignis ab Hannibale est refulsitque idem redditum ab 25 9 10
spemque praedae, circumsedebant. Minucius consul Arretium die quam edixerat ad conueniendum militibus uenit. inde quadrato agmine ad Pisas 35 3 2
ut C. Aurelius consul exercitum, cui in Etruriam ad conueniendum diem edixerat, Arimini eadem die adesse iuberet et aut ipse, si per commodum rei 31 11 1
dimisit, partim distulit Tarraconem, quo omnibus nouis ueteribusque sociis edixerat conuentum. et cuncti fere qui cis Hiberum incolunt populi, multi 26 51 11
concilio Marcellus in Peloponnesum traiecit ⟨Aegium⟩, quo Achaeis edixerat conuentum. ubi conlaudata gente, quod constanter uetus decretum 42 6 1
Ti. Sempronius consul Romanus Sinuessae, quo ad conueniendum diem edixerat, exercitu lustrato transgressus Volturnum flumen circa Liternum 23 35 5
nec insidiis expertus. addebat alacritatem quod dictator praedam omnem edixerat militibus; nec ira magis publica quam priuatum compendium in 8 36 10
Flacco legato per agrum Sabinum Tibur, quo diem ad conueniendum edixerat nouis militibus, uenit. inde Praeneste ac transuersis limitibus in 22 12 2
eadem languesceret mora. his consiliis dictator bellum trahebat grauemque edixerat poenam, si quis iniussu in hostem pugnasset. milites aegre id 7 12 12
minor aliquanto numerus, quia L. Postumius consul pro contione edixerat, qui socium Latini nominis ex edicto C. Claudi consulis redire in 42 10 3
eodem Pisas et Q. Petilius consul ad conueniendum exercitui ⟨diem⟩ edixerat. et C. Claudius proconsul audita rebellione Ligurum praeter eas 41 17 9
uacationem dicebantur habere, dare milites cogebant. quibus recusantibus edixere in diem certam ut quo quisque iure uacationem haberet ad senatum 27 38 3
acciperent pecuniae quicquam ea tempestate in publico esset, edixerunt consules ut priuatim ex censu ordinibusque, sicut antea, remiges 26 35 3
incertis commeatibus per ambitionem imperatorum ab exercitu abesse, edixerunt de militibus P. Aelio ⟨C. Popilio⟩ consulibus postue eos consules 43 14 7
ei laxiorem diem daturos, si uenire ad causam dicendam uellet. edixerunt deinde, ne quis quid fugae causa uendidisse neue emisse uellet; ne 39 17 3
senatui placeret scirent, post reditum legatorum et Sicyonem concilium edixerunt et legatos ad T. Quinctium miserunt qui consilium ab eo peterent. 35 25 4
maxime decemuiri libros adire iussi supplicationem in diem unum populo edixerunt et quinquaginta capris in foro sacrificauerunt. et aliorum 45 16 6
facere. his uocibus mouerunt partem plebis; postremo, indicto iam tributo, edixerunt etiam tribuni auxilio se futuros si quis in militare stipendium 4 60 5
equestrem ordinem offendissent, flammam inuidiae adiecere edicto, quo edixerunt, ne quis eorum, qui Q. Fuluio A. Postumio censoribus publica 43 16 2
una familia essent supplicarent pariter. item ex auctoritate senatus consules edixerunt ne quis, quo die terrae motu nuntiato feriae indictae essent, eo die 34 55 4
praesideret missus; praetores in Siciliam ac Sardiniam profecti. consules edixerunt, quotiens in senatum uocassent, uti senatores quibusque in senatu 23 32 3
qui Taurasinorum ⟨fuerat. eo cum⟩ traducere Ligures Apuanos uellent, edixerunt, ⟨ut⟩ Ligures Apuani de montibus descenderent cum liberis 40 38 3
in diem unum indicta est. iisdem auctoribus et senatus censuit et consules edixerunt, ut per totam Italiam triduum supplicatio et feriae essent. 40 19 5
mandatum ut colonias ab hoste tueretur: consules ex senatus consulto edixerunt ut qui ciues Cremonenses atque Placentini essent ante certam 28 11 11
proficisci iussus est. cum deessent nautae, consules ex senatus consulto edixerunt ut, qui L. Aemilio C. Flaminio censoribus milibus aeris 24 11 7
creando in Hispaniam comitia haberentur; diemque comitiis consules edixerunt. primo exspectauerant ut qui se tanto imperio dignos crederent 26 18 5
habita, credo, ob iram dictatoris creati, tribunorum militum comitia edixerunt. tum uero grauior cura patribus incessit, quippe cum prodi 4 57 10
consulum mandatum est. censores, ut eam rem adiuuarent, ita in contione edixerunt: legem censui censendo dicturos esse, ut praeter commune 43 14 5
in biduum ualetudinis causa in urbe et per omnia fora conciliabulaque edixerunt: maiores duodecim annis omnes coronati et lauream in manu 40 37 3
comitiorum causa exercitus eductus esset, aut plebi concilium tribuni edixissent, aut aliquis ex magistratibus ad contionem uocasset, forte temere 39 15 11
iussi. Horatio Sabini, Valerio Aequi euenere. cum ad ea bella dilectum edixissent, fauore plebis non iuniores modo sed emeritis etiam stipendiis 3 57 9
in ciues certamen uertit et cum inter oppugnationem praedam militis fore edixisset, capto oppido fidem mutauit. eam magis adducor ut credam irae 4 49 9
et dimissi ab iis consulibus essent, ut ad quam diem L. Cornelius consul edixisset et in quem locum edixisset Etruriae conuenirent, et uti L. 34 56 12
essent, ut ad quam diem L. Cornelius consul edixisset, et in quem locum edixisset Etruriae conuenirent, et uti L. Cornelius consul in prouinciam 34 56 13
Anienis castra habuere. dictator cum tumultus Gallici causa iustitium edixisset, omnes iuniores sacramento adegit ingentique exercitu ab urbe 7 9 6
profecta multitudo repleuit castra. tum dictator auspicato egressus cum edixisset ut arma milites caperent, "tuo ductu" inquit, "Pythice Apollo, 5 21 1
post in contionem traducti exposuerunt; renouataque laetitia, cum consul edixisset, ut omnes aedes sacrae aperirentur, pro se quisque ex contione ad 45 2 6
— nam Postumius nihil nisi senatus Romani populiue iussu se locaturum ⟨edixit⟩ — ipsorum pecunia Iouis aedem Pisauri et Fundis et Potentiae etiam 41 27 11

Supplied by Sedgwick Printout Systems

BULLETIN. (Incorporating: Australian Financial Times) 1880. w. Aus.$.25 per no. Bulletin Newspaper Co. Pty. Ltd., Park House, 54 Park St., Box 4088, Sydney, Australia. adv. bk.rev. charts. film rev. illus. mkt. play rev. circ. 40,000.

EVERYBODY'S MAGAZINE. 1961. w. Aus.$9.30. Ed. Robin Brampton. Australian Consolidated Press, 168 Castleroagh St., Sydney, Australia. film rev. circ. 206,000. (Tabloid format)

HEMISPHERE; an Asian-Australian magazine. 1957. m. Aus.$2. Australia Commonwealth Office of Education, 50 Miller St., North Sydney, Australia. adv. bk.rev. charts. illus. circ. 11,280. Indexed: Aus.P.A.I.S.
Australia and South-East asia

N. Z. TRUTH. 1901. w. 52s.($7). Ed. J. Mahoney. News Media Ownership Ltd., 23-27 Garrett St., Wellington, N.Z. adv. bk.rev. film rev. illus. play rev. record rev. circ. 235,471. (Tabloid format)
New zealand

PIX. Vol.86,1967. w. Ed. Robert James Nelson. Jones St., Broadway, Sydney, Australia. adv. bk.rev. film rev. illus. play rev. circ. 172, 000. (Tabloid format)

SUN-HERALD. 1953. w. Aus.$2.50($11.08). Ed. F.R. Peterson. John Fairfax & Sons Ltd., Jones St., Broadway, Sydney, N.S.W., Australia. abstr. adv. bibl. illus. circ. 729,933. (Tabloid format)

SUNDAY MAIL. 1914. w. Aus.$4. Ed. E.R. Jackson. Queensland Newspapers Pty. Ltd., Campbell St., Bowen Hills, Brisbane, Australia. circ. 340,000.

SUNDAY TRUTH. 1901. w. Aus.$3.20. Ed. R. Johnston. Mirror Newspapers Ltd., Brunswick & McLachlan Sts., Fortitutde Valley, Brisbane, Queensland, Australia. adv. bk.rev. film rev. mkt. play rev. circ. 281,000. (Tabloid format)

WIENER MONATSHEFTE;* illustrierte Zeitschrift fuer Kultur, Unterhaltung, Wissen. see *LITERARY AND POLITICAL REVIEWS*

BELGIUM

BIJ DE HAARD. 1911. m. 105 fr.($2). Boerinnenbond, Minderbroedersstraat 8, Leuven, Belgium. illus. circ. 126,500.

LIBELLE. (Editions in Dutch and French) 1945. w. 468 fr.($9.36). Ed. M. Dirickx. Tijdschriften Uitgevers Maatschappij N.V., Van Schoonbekestraat 34-38, Antwerp, Belgium (U.S. Address: Spaarnestad International Inc. o A. Van Zuilen. adv. bk.rev. film rev. illus. play rev. circ. 178,005.
Women's interests

MAAND. (Text in Dutch) 1958. m. 300 fr.($6.10). Ed. Jan Grootaers. Uitgeverij Lannoo, Tielt, Belgium. adv. bk.rev. circ. 2000.

PANORAMA (BELGIUM). (Editions in Dutch and French) 1956. w. 520 fr.($10.40). Ed. V. Depauw. Tijdschriften Uitgevers Maatschappij N.V., Van Schoonbekestraat 34-38, Antwerp, Belgium. adv. illus. circ. 177,363.

PRESENCE DE BRUXELLES. (Text in French) 1950. bi-m. 180 fr.($3.65). Ed. Jean Tordeur. Georges Chantren, 10 rue du Chene, Brussels, Belgium. adv. bk.rev. dance rev. film rev. illus. play rev. circ. 10,000.

REGINA MODE; illustrated women's monthly magazine. (Editions in Dutch and French) 1952. m. 25 fr.($.50) per no. Tijdschriften Uitgevers Maatschappij N.V., Van Schoonbekestraat 34-38, Antwerp, Belgium. adv. illus. circ. 97,979.
Women's interests

Electronic Instrument Div Gen Atronics Corp Philadelphia ... Pa
Fairchild Industrial Products, Plainview ... N Y
Geo Space Corp, Houston ... Tex
Giannini Scientific Corp, Flight Rsch Div, Richmond ... Va
Gordon Enterprises, North Hollywood ... Cal
Hewlett-Packard, Palo Alto ... Cal
Lehigh Valley Electronics Engrg & Mfg Co, Inc Fogelsville ... Pa
3M Company, St Paul ... Minn
Motorola Communications & Electronics Div Chicago ... Ill
Nihon Kohden Kogyo Co Ltd, Tokyo ... Japan
Optomechanisms Inc, Plainview ... N Y
Philips' Gloeilampenfabrieken, N V, Eindhoven ... Holland
Photo-Sonics Inc, Burbank ... Cal
Red Lake Labs Inc, Santa Clara ... Cal
San-Ei Instrument Co Ltd, Tokyo ... Japan
Singer Co, Metrics Div, Bridgeport ... Conn
Technical Operations Inc, Burlington ... Mass
Tektronix Inc, Beaverton ... Ore

CAMERAS--RADAR RECORDING

Abrams Instrument Corp, Lansing ... Mich
Atmospherics Inc, Fresno ... Cal
Canoga Electronics Corp, Chatsworth ... Cal
Chicago Aerial Industries Inc, Barrington ... Ill
Coleman Engineering Co Inc, Santa Ana ... Cal
Conductron Corp, Ann Arbor ... Mich
Decca Radar, Inc, New York ... N Y
Eastman Kodak Co, Rochester ... N Y
Ercona Corp, New York ... N Y
Fairchild Space & Defense Sys Div Fairchild Cam Instr Corp, Syosset ... NY
Lake Systems Corp, Newton ... Mass
Lear Siegler Inc, Santa Monica ... Cal
Lear Siegler Inc, Electronic Instrumentation Div Anaheim ... Cal
Marconi Co Ltd, Chelmsford ... England
Marconi Div, English Electric Corp, New York ... N Y
Maryland Telecommunications Inc, Cockeysville ... Md
Matsushita Electric Industrial Co Ltd, Osaka ... Japan
Midland International Corp, North Kansas City ... Mo
Montedoro Corp, San Luis Obispo ... Cal
Motorola Communications & Electronics Div Chicago ... Ill
Multi Media Engineering Inc, Rockville ... Md
Nippon Electric Co Ltd, Tokyo ... Japan
Philips' Gloeilampenfabrieken, N V, Eindhoven ... Holland
Pierpont Television Co, Birmingham ... Ala
Precision Mecanique Labinal, 93 Saint-Ouen ... France
Radio Corp of America, Comml Elctn Prods Div Camden ... N J
Raytheon Learning Systems Co, Michigan City ... Ind
RCA, Defense Electronic Products, Moorestown ... N J
Sarkes Tarzian Inc, Broadcast Equip Div Bloomington ... Ind
Shiba Electric Co Ltd, Woodside ... N Y
Sony Corp, Tokyo ... Japan
Squires-Sanders Inc, Liberty Corner ... N J
States Electronics Corp, Bludworth Marine Div Linden ... N J
Sylvania Electric Prods Inc, Coml Elctns Div Bedford ... Mass
Teledyne Systems Control Sys A Teledyne Co El Segundo ... Cal
Tele Measurements Inc, Clifton ... N J
Thomson Electric Co, Sub Cie Fran Thomson Houston New York ... N Y
Westinghouse Electric Corp, Aerospace Div Baltimore ... Md
Westinghouse Electric Corp, Scien & Electro Optical Equip Dept, Pittsburgh ... Pa
Zenith Radio Co Govt & Special Prod Div, Chicago ... Ill

CANS--CAPACITOR & COIL

KEYSTONE ELECTRONICS CORP, NEW YORK ... N Y
NUMAR CORP, NEW YORK ... N Y
Eugene Engineering Co Inc, Rockland ... Mass
Eyelematic Mfg Co Inc, Oakville ... Conn
Fansteel Metallurgical Corp, North Chicago ... Ill
Keystone Electronics Corp, New York ... N Y
Kling Metal Spinning & Stpg Corp, New York ... N Y
Mason Mfg Co Div Fram Corp, East Providence ... R I
Northwest Plastics Inc, St Paul ... Minn
Numar Corp, New York ... N Y
Paul & Beekman Inc, Philadelphia ... Pa
Paul & Stein Bros Inc, F H, New York ... N Y
Richards Metal Products Inc, Wolcott ... Conn
Sexton Can Co Inc, Everett ... Mass
Staver Co Inc, Bay Shore ... N Y
Sylvania Electric Prods Inc, Parts Div, Warren ... Pa
United Mineral & Chemical Corp, New York ... N Y
Vector Electronic Co Inc, Los Angeles ... Cal
Victor Metal Products Corp, Harrisonburg ... Va
Waterbury Pressed Metal Co, Waterbury ... Conn

CANS--CRYSTAL

Amuneal Mfg Corp, Philadelphia ... Pa
Crystal Components Plant, GTI Corp, Warren ... Pa
Crystal Components Saegertown Div GTI Corp Warren ... Pa
Eugene Engineering Co Inc, Rockland ... Mass
Eyelematic Mfg Co Inc, Oakville ... Conn
Isotronics Inc, New Bedford ... Mass
Magnetic Metals Co, Camden ... N J
Richards Metal Products Inc, Wolcott ... Conn
Sanyo Electric Co Ltd, Osaka ... Japan
Staver Co Inc, Bay Shore ... N Y
Veritron West Inc, Chatsworth ... Cal
Victor Metal Products Corp, Harrisonburg ... Va
Waterbury Pressed Metal Co, Waterbury ... Conn

HQ792.F7A73 1962A *100480*
BALDICK, ROBERT TR
CENTURIES OF CHILDHOOD. TRANSLATED FROM THE FRENCH BY ROBERT BALDICK LONDON CAPE 1962 447P TRANSLATION OF LENFANT ET LA VIE FAMILIALE SOUS LANCIEN REGIME. INCLUDES BIBLIOGRAPHY
CHILDREN IN FRANCE FAMILY--FRANCE ARIES, PHILIPPE
62-65889 11-1 11-2 12-1 12-2 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1 25-1 26-1 26-2 27-3

DC311.B3. *106831*
BALDICK, ROBERT.
THE SIEGE OF PARIS. NEW YORK. MACMILLAN. 1964. 248.P
PARIS- SEIGE, 1870-1871.

BF721.B144 *103995*
BALDWIN, ALFRED LEE
BEHAVIOR AND DEVELOPMENT IN CHILDHOOD NEW YORK HOLT, RINEHART AND WINSTON C1955 619P
CHILD STUDY
55-14624

BF722.M85 *104521*
BALDWIN, ALFRED LEE
HANDBOOK OF RESEARCH METHODS IN CHILD DEVELOPMENT CONTRIBUTORS; ALFREDL. BALDWIN AND OTHERS NEW YORK WILEY 1960 1061P INCLUDES BIBLIOGRAPHY
CHILD STUDY--METHODOLOGY PSYCHOLOGICAL RESEARCH MUSSEN, PAUL HENRY ED.
60-10321 11-1 13-1 13-6 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1 28-1

HC110. I 5M47 *105061*
BALDWIN, BARBARA
INCOME AND WELFARE IN THE UNITED STATES, A STUDY BY JAMES N. MORGAN, WITH THE ASSISTANCE OF NORMA MEYERS AND BARBARA BALDWIN NEW YORK MCGRAW-HILL 1962 531P BIBLIOGRAPHICAL FOOTNOTES
INCOME--U. S. PUBLIC WELFARE--U. S. MORGAN, JAMES N. MEYERS, NORMA MICHIGAN. UNIVERSITY. SURVEY RESEARCH CENTER
62-17030 17-1

TK275.B29 1962 *103433*
BALDWIN, CLIFFORD THOMAS
FUNDAMENTALS OF ELECTRICAL MEASUREMENTS NEW YORK F. UNGAR PUB. CO. 1962 336P INCLUDES BIBLIOGRAPHY
ELECTRIC MEASUREMENTS MEASURING INSTRUMENTS
62-14800 11-1 11-3 12-1 12-2 13-1 13-6 14-1 15-1 16-1 17-1 18-1 20-1 21-1 22-1 23-1 24-1 25-1 26-1 26-2

PS3552.A45G6 *102242*
BALDWIN, JAMES
GO TELL IT ON THE MOUNTAIN LONDON JOSEPH 1954 256P
52-12199 11-1 11-2 12-1 12-2 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1 25-1 26-1 26-2 27-2

E185.61.B197 1961 *106094*
BALDWIN, JAMES
NOBODY KNOWS MY NAME; MORE NOTES OF A NATIVE SON NEW YORK DIAL PRESS 1961 241P
NEGROES U. S.--RACE QUESTION
61-11596 11-1 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1

E185.61.B197 *102241*
BALDWIN, JAMES
NOBODY KNOWS MY NAME, MORE NOTES OF A NATIVE SON LONDON JOSEPH 1964 196P
NEGROES UNITED STATES--RACE QUESTION
11-1 11-2 12-1 12-2 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1 25-1 26-1 26-2 27-1

E185.61.B2 *102243*
BALDWIN, JAMES
NOTES OF A NATIVE SON LONDON JOSEPH C1964 165P
NEGROES UNITED STATES--RACE QUESTION
11-1 12-1 12-2 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1 25-1 26-1 26-2 27-3 28-1

REF B41.B3 1940 V. 2 *105633*
BALDWIN, JAMES MARK ED.
DICTIONARY OF PHILOSOPHY AND PSYCHOLOGY, INCLUDING MANY OF THE PRINCIPALS CONCEPTIONS OF ETHICS, LOGIC, AESTHETICS, PHILOSOPHY OF RELIGION, MENTAL PATHOLOGY, ANTHROPOLOGY, BIOLOGY, NEUROLOGY, PHYSIOLOGY, ECONOMICS, POLITICAL AND SOCIAL PHILOSOPHY, PHILOLOGY, PHYSICAL SCIENCE, AND EDUCATION, AND GIVING TERMINOLOGY IN ENGLISH, FRENCH, GERMAN, AND ITALIAN, WRITTEN BY MANY HANDS...WITH THE COOPERATION AND ASSISTANCE OF AN INTERNATION BOARD OF CONSULTING EDITORS...WITH...EXTENSIVE BIBLIOGRAPHIES NEW ED. WITH CORRECTIONS NEW YORK P. SMITH 1940- 3 V. IN 4
40-27299 11-1 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1

D103.H392 1967 *106113*
BALDWIN, MARSHALL WHITHED
HISTORY OF WESTERN CIVILIZATION SINCE 1500 2ND ED. NEW YORK MACMILLAN C1967 598P A THOROUGH REVISION OF A PART OF A WORK PUBLISHED IN 1962
EUROPE--HIST. CIVILIZATION, OCCIDENTAL HAYES, CARLTON JOSEPH HUNTLEY, MARSHALL WHITHED BALDWIN AND CHARLES WOOLSE COLE, WOOLSEY CHARLES
62-12524 11-1 11-2 13-1 15-1 16-1 17-1 18-1 19-1 20-1 21-1 22-1 23-1 24-1

Bel A, Hyla R, Pouyet M, et al: Les hématomes des grands droits de l'abdomen observés au cours des traitements anticoagulants.
Lyon Med 219:1351-77, 21 Apr 68 (Fr)

Bel A, Tete R, Levrat R, et al: Ulcère jéjunal 50 ans après gastroentéroanastomose pour ingestion de caustique. Lyon Med 219:1335-49, 21 Apr 68 (Fr)

Belaia KA see **Khrolenko DE**

Bélanger G see **Fortin A**

Bélanger PM, Rovinescu A, Lapalme R, et al: Les néoplasies testiculaires chez le nourrisson et le jeune enfant. Un Med Canada 96:542-4, May 67 (Fr)

Bélanger PM see **Rovinescu I**

Belavin NF, Shakhmatov VG, Chemodanova IS, et al: Novyĭ otraslevoĭ rukovodiashchiĭ tekhnicheskiĭ material "Termicheskaia obrabotka metallov dlia meditsinskikh instrumentov".
Med Promyshl SSSR 20:53-5, Jun 66 (Rus)

Belavina LP: Deĭstvie ioniziruiushcheĭ radiatsii na fond svobodnykh aminokislot v ladrakh, vydelennykh iz timusa, selezenki i pecheni krys.
Radiobiologiia 8:197-200, Mar-Apr 68 (Rus)

Belber CJ, Hoffman RB: The syndrome of intracranial aneurysm associated with fibromuscular hyperplasia of the renal arteries. J Neurosurg 28:556-9, Jun 68

Belbin DJ, Kinnell JD: Another unusual foreign body in the mouth. Anaesthesia 23:437, Jul 68

Belda Mendoza J see **Galdo Seco A**

Belding J see **Anderson WR**

Belen'kaia GM see **Bolkhovitinova LA**

Belen'kaia NIa: O fenomene rasteriannosti (affekt nodoumenlia)
Zh Nevropat Psikhiat Korsakov 66:1369-74, 1966 (Rus)

Belen'kiĭ BG see **Nesterov VV**

Belen'kiĭ EE, Pogosova AV, Tunitskaia TA, et al: Vliianie orotovoĭ kisloty i purinora na miokard pri kompensatornoĭ gipertrofii i giperfunktsii serdtsa, vyzvannoĭ éksperimental'nym stenozom aorty.
Farmakol Toksik 29:685-8, Nov-Dec 66 (Rus)

Belen'kiĭ EE, Tseĭtina Ala, Pomerantseva II, et al: Vliianie orotovoĭ kisloty, ee morfolinovoĭ soli i purinora na sostoianie pecheni pri khronicheskom otravlenii chetyrekhkhloristym uglerodom.
Farmakol Toksik 30:218-21, Mar-Apr 67 (Rus)

Belen'kiĭ GB, Kaufman IA: O prichinakh boleznennosti ékkrinnoĭ spiradenomy kozhi.
Arkh Pat 30:47-50, 1968 (Rus)

Belen'kiĭ MS: K voprosu ob infil'trate i tuberkulome.
Probl Tuberk 46:29-35, 1968 (Rus)

paraaminohipuric (P.A.H.)
Rev Medicochir Iasi 72:357-64, Apr-Jun 68 (Rum)

Belinskaia LP see **Shul'ga IuD**

Belitser VO, Troĭts'kiĭ GV, Serebrianiĭ SB: Doslidzhennia v haluzi khimii ta biokhimiĭ bilkiv, provedeni na Ukraïni za radians'kiĭ chas.
Ukr Biokhim Zh 39:505-15, 1967 (Uk)

(Belitskaia EIa): K 60-letiiu so dia rozhdeniia E. Ia. Belitskoĭ
Gig Sanit 31:118-9, Oct 66 (Rus)

Belkhodja A see **Benabadji M**

Belkin AI, Shumilova NU: O psikhike bol'nykh evukholdizmom.
Zh Nevropat Psikhiat Korsakov 66:440-5, 1966 (Rus)

Belkin MB: Razryv podzheludochnoĭ zhelezy pri zakrytoĭ travme zhivota.
Vestn Khir Grekov 96:137, Mar 66 (Rus)

Bell C see **Hilf R**

Bell EJ see **Grist NR**

Bell ET: Studies of uterine growth in immature mice following gonadotrophin and steroid administration.
J Physiol (London) 197:80P-81P, Jul 68

Bell J see **Salafsky B**

Bell JA see **Tritsch GL**

Bell MC: Nutrition. Swine, sheep and beef cattle phase. ORO-653. US AEC Div Techn Inform 52-7, Jan-Jun 66

Bell R see **Ashworth A**

Bell TE, Hoodin AO, Evans AT: Tubeless cystostomy in children. J Urol 100:459-61, Oct 68

Bell TE, Wendel RG: Cystitis glandularis: benign or malignant? J Urol 100:462-5, Oct 68

Bell TK see **Simniah R**

Bell WB see **Gross W**

Bellamy D see **Schlutz CA**

Bellelli M see **Patané S**

Bellemare G, Inard J, Aubin A, et al: Uptake and incorporation of leucine and thymidine in developing sea urchin eggs. The effect of hexahomoserine.
Exp Cell Res 51:406-12, 1968

Beller FK: Atiologie und Pathogenese von Gerinnungsstörungen unter der Geburt.
Geburtsh Frauenheilk 28:113-32, Feb 68 (113 ref.) (Ger)

Beller FK see **Graeff H**

Belles QC see **Schroffner WG**

Bellet M see **Delorme G**

Bellet S, Kershbaum A, Finck EM: Response of free fatty acids to coffee and caffeine.
Metabolism 17:702-7, Aug 68

Bellet S, Kostis J: Study of the cardiac arrhythmias by lechebno-profilakticheskikh uchrezhdeniĭ Riazanskoĭ oblasti. Zdravookhr Ross Fed 10:40, Dec 66 (Rus)

Belt E see **Castañares S**

Belton EM see **Ross CF**

Beltowski J see **Zając J**

Beltrán F see **Biagi F**

Beltz L see **Sobbe A**

Belyĭ BI: Narusheniia pamiati pri porazheniiakh kruga gippokampa.
Zh Nevropat Psikhiat Korsakov 66:935-43, 1966 (159 ref.) (Rus)

Belyĭ IS: Otdalennye rezul'taty pristenochnoĭ i chrezbryzheechnoĭ intestinoplikatsii pri spaechnoĭ neprokhodimosti kishechnika.
Klin Khir (Kiev) 6:40-3, Jun 67 (Rus)

Belyi IS see **Chukhrienko DP**

Belz GG: Klinisch-experimentelle Untersuchungen mit dem Herzglykosid Proscillaridin unter besonderer Berücksichtigung seiner enteralen Resorptionsquote.
Med Klin 63:96-102, 19 Jan 68 (Ger)

Belzer FO, Ashby BS, Huang JS, et al: Etiology of rising perfusion pressure in isolated organ perfusion.
Ann Surg 168:382-91, Sep 68

Ben Cheikh M see **Kaabi A el**

Ben Chekh M, El-Kaabi A, El-Mekki L, et al: Syndrome de MacLeod: à propos d'une observation.
Tunisie Med 46:141-5, Mar-Apr 68 (Fr)

Ben-Ishai Z, Goldblum N, Becker Y: The intracellular site and sequence of Sindbis virus replication.
J Gen Virol 2:365-75, May 68

Ben M'Rad S see **Kaabi A el**

Ben Salah M: Hypertension artérielle d'origine rénale: à propos d'une observation.
Tunisie Med 46:193-4, Mar-Apr 68 (Fr)

Benabadji M, Taleb A, Belkhodja A, et al: Les hémoglobinoses observées à Alger (1963-1966)
Tunisie Med 45:129-37, Mar-Apr 67 (Fr)

Benabdallah S see **Benaliegue A**

Benacerraf B see **Paul WE**

Benacerraf R see **Bismuth V**

Benaïm P see **Welti JJ**

Benaliegue A, Dubois M, Benabdallah S, et al: A propos de 12 cas d'ulcère duodénal chez l'enfant algérien.
Tunisie Med 46:163-79, Mar-Apr 68 (Fr)

Bénassy M: En relisant "Analyse terminée et analyse interminable".
Rev Franc Psychanal 32:246-62, Mar-Apr 68 (Fr)

Benchimol A, Maroko P: The apex cardiogram. The value of the apex cardiogram in coronary artery

Supplied by Sedgwick Printout Systems

HARP—contd
e-1 – Western N. Y. Water Co. v Comm., 16 AFTR2d 5350, 349 F2d 348 (USCA 2)
e-1 – Lassoff v Gray, 10 AFTR2d 6363, 207 F Supp 851 (DC Ky)
1 – Sefansky; U.S. v, 16 AFTR2d 5641 (DC Mich)
1 – Hoffman, Robert C., 1960 P-H TC Memo 60-935
1 – Welch, Robert H. & Rosa Lena, 1960 P-H TC Memo 60-950
1 – Goodman, Benjamin & Anna, 1961 P-H TC Memo 61-1120
1 – Banks, Thomas W., 1961 P-H TC Memo 61-1297
g-1 – Maceo, Sam, Est. of, 1964 P-H TC Memo 64-322
3 – Custom Component Switches, Inc. v U.S., 19 AFTR2d 560 (DC Calif)

HARP, VERNON F. & VERA, 1957 P-H TC Memo ¶ 57,105
r – Harp v Comm., 3 AFTR2d 630, 263 F2d 139 (USCA 6)
1 – Custom Component Switches, Inc. v U.S., 19 AFTR2d 560 (DC Calif)
q-1 – Banks, Thomas W., 1961 P-H TC Memo 61-1297
q-1 – Maceo, Sam, Est. of, 1964 P-H TC Memo 64-322
q-1 – Goldfield, Martin & Bernice, 1967 P-H TC Memo 67-632

HARPER, DONALD G. & CAROL, 1964 P-H TC Memo ¶ 64,070

HARPER, ELIZABETH V., EST. OF, 11 TC 717, ¶ 11.86 P-H TC 1948
e-1 – Goodman, Admx. v Granger, 243 F2d 269, 51 AFTR 72 (USCA 3)
f-1 – Goodman, Admx. v Granger, 52 AFTR 1940 (DC Pa)

HARPER, HARRY F., 20 BTA 143
1 – Shapiro, Jack, 1961 P-H TC Memo 61-640

HARPER & McINTIRE CO. v U.S., 151 F Supp 588, 51 AFTR 705 (DC Iowa, 4-13-57)
1 – Best Lock Corp., 29 TC 404, 29-1957 P-H TC 222
1 – Best Lock Corp., 31 TC 1235, 31-1959 P-H TC 724

HARPER, ROY P., 6 TC 230
1 – Townsend, Stephen S. & Margery B., 37 TC 839, 37 P-H TC 628

HARPER v U.S., 20 AFTR2d 5777, 274 F Supp 809 (DC SC, 10-9-67)

HARPER, WILLIAM W., 1963 P-H TC Memo ¶ 63,150

HARRAH, JOSEPH A., 30 TC 1236, ¶ 30.130 P-H TC 1958
q – Municipal Bond Corp. v Comm., 15 AFTR2d 410, 341 F2d 687 (USCA 8) [See 30 TC 1241]
g – Municipal Bond Corp., The, 46 TC 220, 46 P-H TC 156 [See 30 TC 1241]
f – Nevin, Thomas W. & Mary E., 1965 P-H TC Memo 65-331 [See 30 TC 1241]
e – Rev. Rul. 62-141, 1962-2 CB 184 [See 30 TC 1241]
1 – Amer. Can Co., 37 TC 210, 37-1961 P-H TC 155, 156
e-1 – Finder, Peter, Est. of, 37 TC 418, 37-1961 P-H TC 325
1 – Peters, Ralph H. & Catherine, 37 TC 805, 37 P-H TC 603
1 – Municipal Bond Corp., The, 41 TC 29, 30, 41 P-H TC 20, 21
e-1 – Hollywood Baseball Assn., 42 TC 259, 42 P-H TC 193 [See 30 TC 1241]
1 – Meridan, Inc., 1962 P-H TC Memo 62-369
1 – Gault, Howard W. & Georgiana R., 1963 P-H TC Memo 63-964
1 – Desilu Productions, Inc., 1965 P-H TC Memo 65-1865
1 – Royalton Stone Corp., 1966 P-H TC Memo 66-652 [See 30 TC 1241]
2 – Municipal Bond Corp., The, 46 TC 236, 46 P-H TC 167
2 – Casella, Julia, 1959 P-H TC Memo 59-348
e-2 – San Diego Transit-Mixed Concrete Co., 1962 P-H TC Memo 62-821
2 – Kitchin, Jack F. & Wilma H., 1963 P-H TC Memo 63-1986

HARRAH, ROBERT E., 30 TC 1236, ¶ 30.130 P-H TC 1958(See Harrah, Joseph A.)

HARRAH, WILLIAM F., 27 BTA 1305
1 – Turner, Rufus F. & Marguerite H., 1964 P-H TC

HARRANGUE, WILLIAM B., EST. OF, 1963 P-H TC Memo ¶ 63,113

HARRELL v TOMLINSON, 10 AFTR2d 6149 (DC Fla, 11-16-62)

HARRELL v U.S., 17 AFTR2d 114 (DC Ark, 6-18-65)

HARRELSON; CROOKS v, 282 US 55, 9 AFTR 571
2 – Regensburg & Sons; U.S. v, 124 F Supp 691, 46 AFTR 821 (DC NY)
f-3 – Fisher Flouring Mills Co. v U.S., 4 AFTR2d 6160, 270 F2d 32 (USCA 9)
n-4 – Rich v Comm., 1 AFTR2d 317, 250 F2d 176 (USCA 5)
4 – McGehee, Exec. v Comm., 2 AFTR2d 6362, 260 F2d 823 (USCA 5)
g-4 – Delk Investment Corp. v U.S., 13 AFTR2d 1076, 228 F Supp 548 (DC Mo)
4 – Mountain Water Co. of La Crescenta, The, 35 TC 418, 35-1960 P-H TC 314
f-5 – St. Louis Co. (Del) (In Dissolution) v U.S., 237 F2d 158, 50 AFTR 262 (USCA 3)
5 – Shirah; U.S. v, 1 AFTR2d 1347, 253 F2d 800 (USCA 4)
5 – Fisher Flouring Mills Co. v U.S., 4 AFTR2d 6161, 270 F2d 32 (USCA 9)
5 – Mercantile Nat. Bank at Dallas; Comm. v, 5 AFTR2d 1023, 276 F2d 63 (USCA 5)
n-6 – Rich v Comm., 1 AFTR2d 317, 250 F 2d 176 (USCA 5)
6 – Acker v Comm., 1 AFTR2d 2002, 258 F2d 573 (USCA 6)
n-6 – DeBonchamps; U.S. v, 5 AFTR2d 1330, 278 F2d 136 (USCA 9)
e-6 – King Trailer Co., Inc.; U.S. v, 16 AFTR2d 6262, 350 F2d 948 (USCA 9)
6 – Cuddihy, Robert J., Est. of, 32 TC 1175, 32-1959 P-H TC 694
6 – Talbott, Inc., Eleanor Buchanan, Est. of, 48 TC 276, 48 P-H TC 199
7 – Union Bankers Ins. Co. v U.S., 11 AFTR2d 2047, 317 F2d 601 (USCA 5)

HARRIGAN v U.S., 18 AFTR2d 5693 (DC ALA, 7-25-66)

HARRILL, ANDREW S. & SADIE J., 1964 P-H TC Memo ¶ 64,221

HARRIMAN & CO.; U.S. v, 131 F Supp 898, 47 AFTR 1642 (DC NY)(See Balanovski; U.S. v)

HARRIMAN NATIONAL BANK v COMM., 43 F2d 950, 9 AFTR 207 (USCA 2)
3 – Rev. Rul. 65-95, 1965-1 CB 209

HARRIMAN RIPLEY & CO., INC.; COMM. v, 202 F2d 280, 43 AFTR 405 (USCA 3)(See Ripley & Co., Inc. Successor; Comm. v)

HARRIMAN, WILLIAM K. & LARETTA B., 1967 P-H TC Memo ¶ 67,190

HARRINGTON, CLAIRE M. v RILEY, 18 AFTR2d 5109, 363 F2d 421 (USCA 1)(See McGarry v Riley)

HARRINGTON, CLAIRE M.; WM. E. RILEY, v, 17 AFTR2d 721, 248 F Supp 545 (DC Mass)(See McGarry; Riley v)

HARRINGTON CO., THE, 6 TC 720
e-1 – United Control Corp., 38 TC 967, 38 P-H TC 732
1 – Jacksonville Paper Co., 1954 P-H TC Memo 54-709
2 – Arcade Realty Co., Inc., 35 TC 267, 35-1960 P-H TC 196
2 – Bell, Marion H., 1957 P-H TC Memo 57-783

HARRINGTON v FLANDERS, 14 AFTR2d 5322 (DC Ariz, 6-26-64)

HARRINGTON, H. M., JR. & MARGUERITE, 48 TC 939, ¶ 48.91 P-H TC

HARRINGTON, PAUL J., 1954 P-H TC Memo ¶ 54,310

HARRINGTON, RICHARD L. & MARY, 1958 P-H TC Memo ¶ 58,194

HARRINGTON, TRUSTEE; U.S. v, 4 AFTR2d 5356, 269 F2d 719 (USCA 4,8-6-59)
f-1 – Bass, Trustee; U.S. v, 4 AFTR2d 5678, 271 F2d 130 (USCA 9)
1 – Mighell; U.S. v, 5 AFTR2d 474, 273 F2d 684 (USCA 10)
f-1 – Kerber Packing Co., In re, 5 AFTR2d 1151, 276 F2d 245 (USCA 7)
1 – Conn. Motor Lines, Inc., In re, 14 AFTR2d 5475, 336 F2d 103 (USCA 3) [See 4 AFTR2d 5358, 269

Supplied by Sedgwick Printout Systems

AA (CONT)
ADJUVANT ♦VINEGAR R
AGENTS
ANALYSIS HOFFMAN CM
ANALYTICAL ♦CHEM ENG N
ARTHRITIS VINEGAR R
ATOMIC HOFFMAN CM
AYA ♦BARTKE A
BLOCKING
BOOST CHEM ENG N
CHROMATOGR HOFFMAN CM
COMPONENT
DELAYED VINEGAR R
DETERMINAT HOFFMAN CM
DISTRIBUTI
DSR VINEGAR R
EFFECTS
FOREFRONT CHEM ENG N
GAS-LIQUID HOFFMAN CM
GLC
ILLICIT
IMMUNOSUPP VINEGAR R
INHIBITORY
MALE BARTKE A
MICE
NAA HOFFMAN CM
NEUTRON
NON-YELLOW BARTKE A
PREGNANCY
REACTIONS VINEGAR R
SENSITIVITY CHEM ENG N
SKIN VINEGAR R
SPIRITS HOFFMAN CM
TECHNIQUES CHEM ENG N
TRACE HOFFMAN CM
VERSATILITY CHEM ENG N
YELLOW BARTKE A

AA BB
AA XX ♦GARBISCH EW
ABC2
ABK2
ABX2
C2V ♦DIEHL P
MAGNETIC
NUCLEAR
ORIENTED
RESONANCE
SPECTRA
SPIN GARBISCH EW
SYMMETRY DIEHL P
SYSTEMS
GARBISCH EW
TYPES
4-SPIN DIEHL P

AA BB TYPE
ANALYSIS ♦CANET D
DIRECT
GENERAL
METHOD
NMR
SPECTRA

AA XX
AA BB ♦GARBISCH EW
ABC2
ABK2
ABX2
SPIN
SYSTEMS
TYPES

AA(SOLID)
♦TARTAREL R
BB
CONTROL
DIFFUSION
G(GAS)
SOLID

AAMERTAN (CONT)
SEED VANSCHRE DA

AAMI
MEETING ♦BEALL AC

AAN
DEFORMATION ♦ROSSARD C
EFFICIENCY
RECRYSTALL.
RESULTS
THERMAL-ME.
TREATMENT

AAPG
ADDRESS ♦CARSEY JB
PRESIDENTI.

AAS
AC ♦SNELLEMA W
CONTINUOUS
DETECTION
LINE
MEETINGS ♦YOCHELSO EL
METHOD SNELLEMA W
MODIFIED
SOURCES

AATCC
ACCOMPLISH ♦STEARNS EI
COMMITTEES
PURPOSE
TECHNOLOGY

AATT
AID ♦AM DYE REP
CAN
COLOR
COMPUTERS
HEARS
MATCHING

AAUP
♦NELSON B

AAZINES
♦PUKANIC GW

AA1
AA2 ♦MICHELI A
AA3
ALLOTYPIC
DEMONSTRAT.
DIRECT
FD-FRAGMEN.
G
IMMUNOGLOB.
QUANTITATI.
RABBIT
SPECIFICIT.

AA2
AA1 ♦MICHELI A
AA3
ALLOTYPIC
DEMONSTRAT.
DIRECT
FD-FRAGMEN.
G
IMMUNOGLOB.
QUANTITATI.
RABBIT
SPECIFICIT.

AA3
AA1 ♦MICHELI A
AA2
ALLOTYPIC
DEMONSTRAT.
DIRECT

AB (CONT)
KINDS FUJIWARA Y
LEUKEMIA MAJSKY A
LEUKOCYTES
LIF BERTONCI PJ
LOSS MAJSKY A
LOW-LYING SCHAEFER HF
METHANE ARRIGHIN GP
METHYLENIM. LEHN JM
MO BUENKER RJ
MOLECULAR CLEMENTI E
MOLECULE SCHAEFER HF
MOLECULES ARRIGHIN GP
COOK DB
SCHWARTZ ME
MORTALITY GRUNDER AA
NAF BERTONCI PJ
NALI
NALI
NA2
NITROGEN LEHN JM
VEILLARD A
NOTE GRUNDER AA
ODD WILSON M
OPERATING IVNAS AL
O2 SCHAEFER HF
PARADOXICAL AMBROSE CT
PATIENTS MAJSKY A
PHENOTYPES GRUNDER AA
PHYSICS CLEMENTI E
POLARITY MARIANO AN
POLYATOMIC COOK DB
POTENTIAL BERTONCI PJ
KLEIN DJ
MOORE RA
PREGNANT MUELLERE C
PRELIMINARY ARRIGHIN GP
PROGRAM QUINN J
PSI(O)/2 WILSON M
PULP LEFFLER AJ
QUANTUM-ST. OLSZEWSK S
RABBITS GRUNDER AA
RATES
REACTION WILSON CW
RECENT BERTONCI PJ
RESPONSE AMBROSE CT
RESULTS ARRIGHIN GP
RUBRUM PARONETT F
SCF BUENKER RJ
SCF-LCAO-MO LEHN JM
VEILLARD A
SCREENING WILSON M
SERUM MUELLERE C
SMALL AHLRICHS R
SCHWARTZ ME
SPECIAL QUINN J
SPECTROSCO. WILSON M
SPECTRUM BUENKER RJ
SPIN FUJIWARA Y
STABILITY BUENKER RJ
STATES SCHAEFER HF
STUDIES SCHWARTZ ME
STUDY BUENKER RJ
LEHN JM
VEILLARD A
SULFATE LEFFLER AJ
SULFITE
SURFACE WILSON CW
SYNTHESIS SPENCER TA
SYSTEMS BERTONCI PJ
FUJIWARA Y
TETRAHEDRAL MARIANO AN
TH WILSON M
USING SCHWARTZ ME
VITRO AMBROSE CT
WAVEFUNCTI. BERTONCI PJ
WEAK MUELLERE C
WOMAN
WOULD QUINN J
YOUNG GRUNDER AA

ABATE (CONT)
BANGKOK GLANCEY BM
BREEDING
BRIQUETTES ♦BARNES WW
CONCRETE GLANCEY BM
CONTROL ♦LAWS ER
DURSBAN GLANCEY BM
♦LEWIS LF
EFFECTIVEN. LAWS ER
EVALUATION BARNES WW
EVALUATIONS FALES JH
FIELD BARNES WW
FALES JH
LAWS ER
HEMIPTERA- FALES JH
INSECTICIDE ♦BLINN RC
INVOLVING LAWS ER
JARS GLANCEY BM
L
LABORATORY FALES JH
MALATHION LAWS ER
NORTHWEST LEWIS LF
NOTONECTA FALES JH
OBSERVATIO. LAWS ER
POOLS BARNES WW
POTABLE LAWS ER
PROGRAM
PROJECT LEWIS LF
RESIDUES ♦BOWMAN MC
SAFETY LAWS ER
SAY FALES JH
STUDIED LEWIS LF
STUDY LAWS ER
THAILAND GLANCEY BM
TREATING LAWS ER
UNDULATA FALES JH
WATER GLANCEY BM
LAWS ER
WOODLAND BARNES WW

ABATEMENT
ACID ♦TESKE W
AIR ♦ABELSON PH
♦AIKEN WH
APPROACH ♦MARTIN HW
ATMOSPHERIC ♦MUKHERJI A
BOX ♦JOSEPHSO KL
COMBUSTOR ♦GLEASON JG
COMPRESSOR. MARTIN HW
COOK ♦JOHNS BE
COUNTY
JOSEPHSO KL
DESIGN GLEASON JG
DISCHARGE ♦BYCHKOVA LG
DISTRICT JOHNS BE
JOSEPHSO KL
DRIVE JOHNS BE
EDIBLE ♦FRITZ E
ELDER JOSEPHSO KL
EMISSIONS TESKE W
ENGINE MARTIN HW
ENGINES GLEASON JG
EQUIPMENT JOSEPHSO KL
FEASIBILITY ♦LORENZEN GA
FILMS
FLY JOSEPHSO KL
GAS GLEASON JG
HAND JOHNS BE
MANUFACTURE TESKE W
MODULAR MARTIN HW
MONOMOLECU. LORENZEN GA
MOSQUITO JOHNS BE
JOSEPHSO KL
LORENZEN GA
NANOSECOND BYCHKOVA LG
NAVYS ♦SINGERMA HH
NITRIC TESKE W
NITROGEN
NOISE MARTIN HW
OIL FRITZ E

ABBREVIATED (CONT)
COMMISSION J BIOL CHEM
COMPREHENS. RAMIREZM J
CONSUMPTION ♦MAXFIELD ME
DECISION ♦FISHBURN PC
DYNAMIC RAMIREZM J
EXPRESSION
EXTINCTION ♦SPIVEY JE
FLAME RAMIREZM J
FOLLOWING SPIVEY JE
FORM REID WB
INFLUENCE SPIVEY JE
INTERTRIAL
IUPAC-IUB BIOCHEM J
J BIOL CHEM
MEASUREMEN MAXFIELD ME
MENTALLY REID WB
METHODS MAXFIELD ME
MODEL FISHBURN PC
NOMENCLATU ARCH BIOCH
BIOC BIOP A
BIOCHEM
BIOCHEM J
J BIOL CHEM
REGELN V
OXYGEN MAXFIELD ME
PARTIAL SPIVEY JE
PATTERN
PERFORMANCE
PHOTOMETRY RAMIREZM J
PHYSIOLOGY MAXFIELD ME
POLYMERIZED ARCH BIOCH
BIOC BIOP A
BIOCHEM
BIOCHEM J
J BIOL CHEM
REGELN V
POLYPEPTID. ARCH BIOCH
BIOC BIOP A
BIOCHEM
BIOCHEM J
J BIOL CHEM
REGELN V
RANGES RAMIREZM J
REINFORCEM SPIVEY JE
RETARDED REID WB
RULES ARCH BIOCH
BIOC BIOP A
BIOCHEM
J BIOL CHEM
REGELN V
STATES FISHBURN PC
SYNTHETIC ARCH BIOCH
BIOC BIOP A
BIOCHEM
BIOCHEM J
J BIOL CHEM
REGELN V
TENTATIVE ARCH BIOCH
BIOC BIOP A
BIOCHEM
J BIOL CHEM
REGELN V
TRAINING SPIVEY JE
USE REID WB
WISC
WORK MAXFIELD ME
WORLD FISHBURN PC

ABBREVIATING
DIFFERENCES ♦MEIKLE S
EFFECT
SUBTEST
WAIS

ABBREVIATION
ACTION ♦ANTONI H
FROGS
MAMMALIAN
MECHANICAL

ABDOMEN (CONT)
CLOSURE ♦BONNAR J
COARCTATION EGER H
COCKROACH ♦KEHLER JG
COLOR KUIT AR
COLUMN ♦NATHAN H
COMPRESSION
♦SCHREIBE MH
CONGENITAL ♦GIBBS RC
CONSECUTIVE GRAVES DS
CONTRIBUTI. GRIMBY G
DIAGNOSIS EGER H
ELLIS H
♦HOFFMAN JF
DIAGNOSTIC HERRMANN K
PROUT WG
DIFFERENTI. EGER H
DISEASES
ELDERLY STREMPLE JF
EVALUATION PROUT WG
EXERCISE GRIMBY G
EXPERIENCE BRACEY DW
EXPLORATORY ♦BULL JC
FILM HERRMANN K
FOLLOW-UP GRAVES DS
GENOTYPES KUIT AR
HENOCH-SCH STREMPLE JF
HETEROCHRO. GIBBS RC
INFANCY LEIX F
INFANTS ♦MOFENSON HC
INJURIES ♦GARLAND JB
LAPAROTOMY BULL JC
LATERAL SCHREIBE MH
LEVEL GEINDRE M
LOWER BONNAR J
♦HEITZMAN ER
MANAGEMENT ♦FRIEDMAN P
LEIX F
♦STEIN A
MANDATORY ♦MAYNARD ADL
MASS HEITZMAN ER
MECHANOREC. KEHLER JG
MELANIN KUIT AR
MICROPOROUS BONNAR J
MIDLINE HEITZMAN ER
NEONATE HOLDER TM
NEVUS GIBBS RC
NEW BRACEY DW
KEHLER JG
NONSURGICAL STREMPLE JF
OPERATION MAYNARD ADL
OSTEOPHYTES NATHAN H
PANCREATIT. HERRMANN K
PARACENTES. PROUT WG
PATIENT STREMPLE JF
PATIENTS BULL JC
GRAVES DS
PENETRATING ♦BR MED J
BULL JC
GARLAND JB
MAYNARD ADL
STEIN A
PLAIN HERRMANN K
PREGNANCY SCHREIBE MH
PREVENTION BRACEY DW
RELATIONSH KUIT AR
RELATIVE GRIMBY G
RIB
KONNO K
ROENTGENOG. SCHREIBE MH
ROENTGENOG GRAVES DS
ROENTGENOG HOFFMAN JF
ROUTINE GRAVES DS
SELECTIVE FRIEDMAN P
STEIN A
STAB FRIEDMAN P
HOFFMAN JF
STAB-WOUNDS GARLAND JB
STATIC KONNO K
STUDY GEINDRE M

ABDOMINAL (CONT)
AORTA PAIS SO
POTTER DJ
♦SAHLER OD
SMITH RB
♦SUN CN
VONDERLA M
WELSH P
AORTAS CURTIS J
AORTIC ♦BERTELSE S
COHN R
COUPLAND GA
COX WL
GOBBELER T
GRAHAM AL
LABARDIN MM
LOWENTHA MN
MAY AG
MOORE WS
♦PERRY MO
SCHILLIN FJ
SIGLER L
SLANEY G
THOMPSON BW
AORTOCAVAL ♦NENNHAUS HP
AORTOGRAPHY ♦BRINSFIE D
♦FINBY N
♦FREEARK RJ
APLYSIA ♦GILLER E
APOIDEA ♦YOUSSEF NN
APPROACH FREEARK RJ
ARTERIAL BARON HC
KILLEN DA
ARTERIES BARON HC
ARTERIOGRA. ECOIFFIE J
♦UEDA H
ARTERIOGRA ♦SCHREIBE MH
ARTERY ♦ANSFIELD FJ
HARJOLA PT
LOWENTHA MN
SMITH RB
♦WIRTANEN GW
ASCENDING ♦ZHANTIEV RD
ASCITES ♦ANGHILER LJ
ASSOCIATED CURTIS J
DELORENZ AJ
HALPERN M
KILLEN DA
♦NADOL JB
ASSOCIATION ♦SHIBUTAN K
ATRAUMATIC ♦DUNLOP J
AUTOSUTURE ♦KAHN E
AXIS ANSFIELD FJ
WIRTANEN GW
AXO-DENDRI. DELORENZ AJ
NADOL JB
BAKER-HIIGH ♦MARIN GA
BAND-VARIA. ♦NAYAR JL
BANDING ♦KING HA
BATTERED ♦TOULOUKI RJ
BEHAVIORAL ♦FLORENTI GJ
BENGAL ♦FREEMAN LM
BILE ♦DOBBIE RP
BIOPSY MARIN GA
BLOOD ♦BAUDACH H
♦GELIN LE
♦PAAPE MJ
STONE HL
BLUNT ♦DIVINCEN FC
DOBBIE RP
FREEARK RJ
SCHREIBE MH
♦TANK ES
BLUTN ♦ROONEY JA
BONE MUCCHI L
BRANCHES KAHN PC
KILLEN DA
BRANDENBURG BLISS BP
BREECH ♦FISCHERR W
BRUSHES ♦APLIN RT

ABDOMINAL (CONT)
DIAGNOSTIC ♦BIRCHER J
♦CAN MED A J
FREEARK RJ
GJESSING J
DIALYSIS
DIAPHRAGM BISHOP B
DIAPHRAGMA BOJINOV S
♦GAYRARD P
DIARRHEA ♦SEIJFFER MJ
DIATRIZOATE ♦SMITHWIC W
DIFFERENT VONDERLA M
DIFFERENTI. EGER H
DIFFICULT STIRNEMA H
DIGESTIVE MARTIN A
DIPTERA NAYAR JL
DISCORDANT ♦HASTREIT AR
DISEASE AACH R
ABELES H
♦FELLOWS KE
FREEMAN LM
HOLM HH
KILLEN DA
♦KISSEL P
NILEHN B
♦NORMAN GF
POTTER DJ
♦YAMADA H
DISEASES EGER H
MUCCHI L
RICE RP
DISPLACEME. SACK WO
DISRUPTION ♦LEHMAN JA
DISTINCT NENNHAUS HP
DISTRIBUTI. ♦EDLICH RF
GILLER E
TEWARI HB
DISTURBANC. MUNSTER W
DOG ♦LICHTENH F
DOGS STONE HL
DOUBLE ♦GURICH HG
DRAINAGE LINDGREN I
DRUG ABELES H
DRUGS COLLIER HOJ
DUCT DOBBIE RP
DUODENAL MARIN GA
SWART B
DURBAN DENT CE
EAST WATSON WC
EATING BRAUN T
ECG VANBEMME JH
EEG ALEXANDR E
CHASE MH
EFFECT DANIELSS M
♦MACBETH WAA
SCHEININ TM
EFFECTS FELLOWS KE
GAYRARD P
PAAPE MJ
ELECTROPHY. CORBIERE G
EMBOLI SMITH RB
EMBRYONIC PARRY W
EMERGENCIES BANK S
♦DOUGLAS JB
EMERGENCY SLANEY G
EMPHYSEMA DAVIS RM
EMPIRICAL ♦ZEHNDER MA
ENDOCARDIAL HALLIDIE KA
ENDOTHELIAL SUN CN
ENTRY ♦PHILLIPS RW
ENZYME BALDWIN RL
EPILEPSY ALEXANDR E
ERISTALIS NAYAR JL
ESOPHAGEAL ♦VANSANT JH
ESOPHAGUS SWART B
ETIOLOGY ♦DEVOR D
EVALUATION ♦MEYERS HI
UEDA H
EVENTRATION ♦GROVES AC
EWE ♦FORBES JM

ABDOMINAL (CONT)
INGUINAL PAGOVICH BL
INJECTION ANGHILER LJ
CARTER JW
SMITHWIC W
INJURIES ♦BRAWLEY RK
TOULOUKI RJ
INJURY BEFELER D
INNERVATION SEABROOK WD
INOPERABLE LASSNER J
INSECT TOSELLI PA
INSUFFICIE BARON HC
INTERPOSIT SHIP AG
INTERPRETA FREEMAN LM
INTERSEGME TOSELLI PA
INTERSTITI DAVIS RM
INTERUTERI MORGER R
INTESTINAL DAVIS RM
INTRACTABLE SEIJFFER MJ
INTRAPERIT ANGHILER LJ
INTRAVENOUS FINBY N
INVERSUS GURICH HG
IRRADIATION FELLOWS KE
ISRAEL STEINITZ H
JUNCTIONS DELORENZ AJ
NADOL JB
KIDNEY COX WL
KILLEN DA
LACTATING BALDWIN RL
LAPAROTOMY DEVOR D
LARGE CORBIERE G
PINGREE JH
LARVAE CORBIERE G
LATE COHN R
LATERAL LICHTENH F
LAVAGE GJESSING J
LEFT SACK WO
LEPIDOPTERA APLIN RT
LESIONS VASILESC N
WIRTANEN GW
LEUKOCYTES PAAPE MJ
LEVELS BALDWIN RL
BAUDACH H
LIMITS ♦BANFI
LINNAEUS NAYAR JL
LIVER FREEMAN LM
GELIN LE
YAMADA H
LIVING DENT CE
LLIAC BARON HC
LOCUST SEABROOK WD
LOOP WEISBERG MG
LOWER DANIELSS M
NORMAN GF
STEEL GC
LUCIDULUS CORBIERE G
LUMBAR DENT CE
LUNG BELL JW
LYMPHOMA SEIJFFER MJ
MAJOR KILLEN DA
LEBRAS JY
MALABSORPT SEIJFFER MJ
MALE APLIN RT
MALIGNANCI ANSFIELD FJ
MALIGNANT WIRTANEN GW
MAN GAYRARD P
GELIN LE
MACBETH WAA
MANAGEMENT DIETHRIC EB
FREEARK RJ
HENRIKSE EH
PRINTEN KJ
SMITHWIC W
MASSES BRINSFIE D
FELLOWS KE
RAFFENSP J
SAMUELS LD
MASSIVE ♦GOYANES AD
WOODS AC
MATERNAL BENCH J

ABDOMINAL (CGNT)
PERORAL MARIN GA
PHEROMONES APLIN RT
PHONOARTER UEDA H
PHOSPHATAS TEWARI HB
PHYSICAL FORBES JM
PIG BIRKELAN R
PITFALL FREEMAN LM
PLACENTA ♦CURRY GC
PLAIN RICE RP
PLASTIC COHN R
PHILLIPS RW
PNEUMATOSIS DAVIS RM
POINTERS ZEHNDER MA
POLYPROPYL. JOHNSON JH
POORLY DANNERT F
POPULATION WATSON WC
PORTAL SWART B
POSITION GAYRARD P
POSSIBILIT. BANFI
POSTTRAUMA SMITH RB
POTENTIALS MARTIN A
PREGENITAL SEABROOK WD
YOUSSEF NN
PREGNANCY BLECHER JA
BR MED J
CURRY GC
KORNBLAT MB
LATHROP JC
PREGNANT FORBES JM
PRESENTATI. BOJINOV S
FISCHERR W
PREVENTING BEFELER D
PREVENTION ANGHILER LJ
ARQUINT A
LEHMAN JA
PRIOR BELL JW
PROBABLE FLORENTI GJ
PROBABLY VASILESC N
PROBLEMS PREVOT R
PROCEDURE PINGREE JH
PROCESSES PREVOT R
PROLIXUS TOSELLI PA
PROPERTIES VONDERLA M
ZHANTIEV RD
PROSTATECT. PAGOVICH BL
PROSTHESIS SUN CN
PROTEIN MACBETH WAA
PROTONS DANIELSS M
PULMONARY GROVES AC
QUALITY BECKER JA
QUESTIONS PREVOT R
RABBIT BAUDACH H
DANIELSS M
RABBITS VONDERLA M
RADICAL MAGARA M
RADIOACTIVE EDLICH RF
RADIOGRAPH BECKER JA
LINDGREN I
ROMANIUK PA
RADIOLOGIC MEYERS HI
RADIOLOGY MUCCHI L
RADIONUCLI. CURRY GC
RARE STIRNEMA H
RAT PARRY W
RATS BRAUN T
RECEPTOR DELORENZ AJ
NADOL JB
RECEPTORS FLORENTI GJ
RECTUM BERTELSE S
RECURRENT HOLT GW
MOORE SW
SCHMITT BD
SMITH RB
REFEEDING BRAUN T
REFERENCE GOBBELER T
MATSUKUR S
REGIONAL GILLER E
REGISTRATI. MARTIN A
RELATED SCHEINOK PA

Supplied by Rocappi Inc.

DESCRIPTION (Cont'd)

Flexibility and priority for certain inputs through the use of the 32 position programming board and cords permits rearrangement of the inputs where more frequent polling of selected transmitters is desired. After the initial sequential program is worked out by the commercial and the customer, the commercial should specify the requirements on the service order so that the Plant may arrange the program board accordingly. Subsequent changes should be made by the Plant when covered by service order. The board consists of a jack panel mounted in the apparatus cabinet which houses the sequencing unit or units. There are 16 input jacks and 64 sequence jacks in the programming panel for each sequencing unit. Patch cords are used to make the necessary connections of the inputs to as many sequencing positions in the board as desired.

The transmitters of the 28ASR's can be either single-contact or multi-contact transmitter distributors, however, torn tape operation must be used from these sets. ***The transmitters may be used as a continuous tape station by adding a (7VPUN) End-of-Transmission switch.***

Incremental Arrangement for Different Premises (SA1)

This arrangement permits an input transmitter to be located off premises. When the basic sequential equipment is installed in accordance with DWG CA-14183 (a special arrangement) the distance is limited to 1/4 mile (air line mileage). When the basic sequential equipment is installed in accordance with DWG EA-12938 (the standard arrangement) the distance between premises can be up to 75 circuit miles (not exceeding 5000 ohms loop conductor resistance). Control conductors required for these arrangements are included in the rates.

28RT NNNN End-of-Message Reader (RY7)

This arrangement provides for operation of the sequentially controlled transmitter arrangement (S18) when "NNNN" end-of-message code is used.

It consists of a modification of the FIGS H LTRS end-of-message reader. The modification covered by DWG WA-17402 affects drawings EA-12917 and EA-12938. When modified for the "NNNN" end-of-message code the FIGS H LTRS end-of-message code is invalidated.

ALARM ARRANGEMENTS—SPECIAL

TARIFF ITEM F.C.C. 260 Pages 184, 222 Miscellaneous Equipment	Charges Installation	Monthly 45/55 Bauds	 75 Bauds	USOC
Alarm Arrangements, Special				
Form Out for 19 Type Teletypewriters	$10.00	$2.00	-	34M
Paper Out for 19 Type Teletypewriters	5.00	4.50	-	35M
Paper Out for 28 or 35 Type Teletypewriters	10.00	1.50	$1.50	35N

DESCRIPTION

Form-Out Alarm (34M)

A Form-Out Alarm is available for the 15 or 19 teletypewriter when equipped with a cover paper guide (591) for using superfold paper. A switch

This alarm is especially useful for receiving only machines at locations where the machines are not constantly attended. In such cases the alarm is set to ring long before the end of the roll so that the attendant will not leave the machine with

of New Mexico and the First Amendment to the Constitution of the United States.

5. That the furnishing of free textbooks to schools other than tax supported schools violates the Constitution of New Mexico.[90]

6. That the furnishing by the State of sectarian indoctrinated textbooks to private parochial schools is in violation of the First Amendment to the Constitution of the United States.

7. That the furnishing by the State of free school bus transportation to pupils of parochial schools is in violation of the constitution of New Mexico and the First Amendment to the Constitution of the United States.[91]

8. That the teaching of sectarian doctrine in the tax supported schools violates the constitution of New Mexico and the First Amendment to the Constitution of the United States.

9. That the holding of tax supported school classes in buildings which have religious emblems such as crosses, grottos, religious statuary and religious pictures, all peculiar to a certain denomination, violates the First Amendment to the Constitution of the United States.

10. That the holding of tax supported school classes in a building owned by the Roman Catholic Church or an Order thereof or an official thereof, part of said building being retained by said Order, Church or Official for use as a private or parochial school is in violation of the First Amendment to the Constitution of the United States.

11. That there is no separation between Church and State as contemplated and required by the First and Fourteenth Amendments to the Constitution of the United States in 27 named schools in New Mexico.

It was argued in behalf of the Church that the entire controversy was academic, inasmuch as the divorce of the parochial schools from the public schools had been completely effected by the joint action of the archbishop and the state board of education before the appeal was argued. The state supreme court, however, issued its decision and its injunction to prevent a possible repetition of the situation at some future time.

Other Cases

The North College Hill and Dixon controversies are unfortunately not unique, but are typical of what happens when members of a community decide to revolt against the kind of education imposed on their children when a parochial school is incorporated into the public school. These controversies frequently find their way into the courts—usually on suit by irate Protestant parents. The effect on Protestant-Catholic relations in the community is invariably disastrous. The conflicts among warring sects that our constitutional fathers strove so valiantly to keep from these shores are reproduced in miniature in small midwestern towns. Political campaigns are fought

Supplied by Rocappi Inc.

himself would have thought of. But authority was always dim. Still, on the whole, perhaps it would be better not to risk it.

He got out his old typewriter again and typed a letter to the registrar at Rugby. It purported to be from Harold Lever, whose present address was 15 Bampton Gardens, N.W.3. It gave Harold Lever's place and date of birth and parents' names, and requested that a copy of his birth certificate be sent to him as soon as possible. Bliss looked up the fee in an almanac, went out and bought a postal order, and dispatched the letter. The operation would take a little longer this way than if he'd gone straight to Somerset House with the particulars, but it was safer than a public appearance.

Back at the flat, he tore all the advertisement applications into small pieces and flushed them away in the bathroom.

The copy of the birth certificate arrived just thirty-six hours later. Bliss collected it from the hall table with some other items of mail, checked it over in the study, and went gleefully to his desk to compose a final letter:

Dear Mr. Lever,

I am writing to you on behalf of Mr. George Lennox, with whom you have recently been in correspondence about a post as help/companion. I am very sorry to have to tell you that Mr. Lennox yesterday suffered a severe heart attack and is now in hospital. You will appreciate that all his plans have had to be canceled and it is now most unlikely that he will be able to go abroad. I am sure he would wish me to convey his regret for any disappointment you may have been caused. I am returning the birth certificate which you were kind enough to submit.

Yours sincerely,
A. E. Stanton
Secretary to Mr. Lennox

About this book . . .

This is the first book for which the complete text was set by electronic composition. The text is set in 10 point Videocomp Janson, using the RCA Videocomp and computer system. The type was composed in completed page forms, written with an electronic beam on the face of the high-resolution cathode ray tube at speeds of up to 600 characters per second.

Format was by Sidney Feinberg.
Production was directed by Peter Mollman.
Printed and bound by The Haddon Craftsmen, Inc., from film positives
HARPER & ROW, PUBLISHERS, INCORPORATED

MAXWELL Elmer J Worton Md 21678
16C 12-14 M
MAXWELL Frederick A R F D 1 Canastota N Y 13032
G 41-42 SP AGR
MAXWELL Dr Henry 40 Bacon Rd Newton Mass
02100 41C 37-41 DVM 41
MAXWELL James D 715 Grove Ave Raleigh N C
27606 G 62-65 MS 65
MAXWELL Juanita (see Lee Mrs Robert E)
MAXWELL Kenneth E 16751 Greenview Lane
Huntington Beach Calif 92647 G 34-37 PHD 37
MAXWELL Leo C 924 Danby Rd Ithaca N Y 14850
63C 59-60 M
MAXWELL Margaret (see Baldwin Mrs Ewart M)
MAXWELL Marjorie (see Glantz Mrs Leon J)
MAXWELL Dr Ralph A East Greenwich N Y 12826
36C 31-36 A DVM 36
MAXWELL Dr Richard B Jr 555 Birch Ave
Westfield N J 07090 G 42-45 MD 45
MAXWELL Robert G R D 1 Olean N Y 14760
25C 21-30 BS AGR 25 PHD 30
MAXWELL Robert W Jr 607 Horizon View Pittsburgh
Pa 15235 52C 48-52 AB 52
MAXWELL Rodney L 924 Danby Rd Ithaca N Y 14850
38C 34-38 BS 38
MAXWELL Dr William 285 N Quaker Lane West
Hartford Conn 06119 56C 52-56 AB 56
MAXWELL William H Star Route Massena N Y 13662
60C 56-59 SP AGR AGR
MAXWELL William L 105 Besemer Rd Rt 2
Ithaca N Y 14850 56C 52-61 BME 57 PHD 61
MAY Adelaide (see Demarest Mrs William)
MAY Allen H Riverside Dr Fairhill Acres Ridgefield
Conn 06877 52C 48-49 A
MAY Althea (see Burns Mrs John F)
MAY Anne (see Wetherill Mrs Robert Iii)
MAY Arthur G East Woods Rd Pound Ridge N Y 10576
15C 11-12 AGR
MAY Barbara (see Patrick Mrs Leslie S)
MAY Betty (see Thompson Mrs Paul S)
MAY Lt Cmdr Carl R Msc,usn Chief Food Service Div
U S Naval Hospital Great Lakes Ill 60085
61C 59-61 BS HOTEL 61
MAY Charles C Rt 1 Box 601 Oak Harbor Wash 98277
10C 06-08 M C
MAY Charles F Jr 165 John St Troy Pa 16947
49C 45-47 A
MAY Clarence R 12713 Douglas Ave Yucaipa Calif
92399 14C 10-12 LAW
MAY Mrs David C (Shaw Linda) 6027 Metcalf Lane

MAY Robert J Moriah Center N Y 12961
G 41-43 SP AGR
MAY Rodolph L Jr 1413 Crestridge Dr Silver Spring
Md 20910 65C 61-63 ENGR
MAY Ruth (see Minton Mrs James)
MAY Mrs Thomas C (Pendleton Virginia) 1538 S
Webster Green Bay Wisc 54300 53C 49-53 BS
AGR 53
MAY Thomas C 1538 S Webster Green Bay Wisc
54300 53C 51-53 BS AGR 53
MAY Mrs William (Sichel Eleanor) 180 East 79th St
New York N Y 10021 38C 34-38 BS 38
MAY William B Savings Bank Bldg Lockport N Y
14094 G 53-56 LLB 56
MAY William L Jr 94 Grayfield Ave West Roxbury Mass
02100 63C 59-64 BCE 64
MAYARD Charles J Box 9635 Riviera Beach Fla 33404
36C 32-34 HOTEL
MAYBERRY Miss Elizabeth C 1760 First Ave New
York N Y 10028 62C 58-63 A NURS AB 63
MAYBERRY Capt Francis T 5042 N Capitol Ave
Indianapolis Ind 46208 38C 34-36 AGR
MAYBERRY Robert W 110 W Upland Rd Ithaca N Y
14850 G 60-61 AM 61
MAYBERRY Mrs Robert Westmoreland (Srb Rosalind)
110 W Upland Rd Ithaca N Y 14850
65C 61-65 AB 65
MAYBURY Reta (see Waln Mrs James A)
MAYBURY Ruth (see Sloan Mrs Harold R)
MAYCOCK Mrs James (Lord Nancy) R D 1
Holcomb N Y 14469 64C 60-61 HE
MAYEHOFF Mrs Edward (Conditt Joy) 4936 Hillard Ave
La Canada Calif 91011 38C 34-36 AGR
MAYER Alfred J Jr 380 Neff Grosse Pointe Mich
48236 32C 27-32 ME 32
MAYER Almee (see Baruch Mrs Paul)
MAYER Barbara (see Cunningham Mrs Richard)
MAYER Bernard 1728 Roberta Lane Merrick N Y
11566 53C 49-56 B CHEM E 56
MAYER Bruce W 19501 S Woodland Shaker Hgts
Ohio 44120 42C 38-42 CH E AB 42
MAYER Carol (see Utter Mrs Kenneth L)
MAYER Mrs David L (Davison Anne) 21 W 89th St
New York N Y 10024 51C 47-51 AB 51
MAYER David L 21 W 89th St New York N Y 10024
50C 46-50 AB 50
MAYER Major Donald F Marine Barracks
Washington D C 20000 53C 49-53 AB 53
MAYER Edgar N 34-44 82nd St Jackson Heights N Y
11372 45C 41-45 AB 45

MAYER Joseph N 142 Ridgecrest Rd Ithaca N Y
14850 45C 41-43 E
MAYER Dr Karl 130 Hillside Road Naperville Ill 60540
35C 31-40 BS 36 DVM 40
MAYER Mrs Karl B Jr (Norton Joanne) Gallison Ave
Marblehead Mass 01945 48C 44-48 AB 48
MAYER Karl H 1807 Los Alamos St San Clemente Calif
92672 15C 11-15 ME 15
MAYER Mrs Karl H (Wilson Dorothy) 1807 Los Alamos
St San Clemente Calif 92672 14C 10-14 AB 14
MAYER Mrs Kurt A (Johnson Elna) 394 So Shore Dr
Sarasota Fla 33577 19C 16-19 AB 19
MAYER Kurt A 394 So Shore Dr Sarasota Fla 33577
20C 16-20 BS 20
MAYER Lauren D R R 1 Enniskillen Canada
24C 20-23 M
MAYER Lesley B 16C 12-13 ARCH
MAYER Lois (see Pearson Mrs John R)
MAYER Miss Lois D 41 Dana St Cambridge Mass
02138 62C 58-62 BS HE 62
MAYER Ludwig S 2615 Magnolia Knoxville Tenn
37914 17C 14-18 SP AGR BS 18 G
MAYER Miss Margaret Magruder 77 Coolidge Rd North
Syracuse N Y 13212 65C 61-65 AB 65
MAYER Marilyn (see Devine Mrs Alfred J)
MAYER Marjorie (see Roberts Mrs John J)
MAYER Oscar G Jr 722 Wilder Dr Madison Wisc
53704 34C 30-34 AB 34
MAYER Patricia (see Heimbach Mrs David M)
MAYER Paul 63 Avon Circle Port Chester N Y 10573
59C 55-59 AB 59
MAYER Mrs Paul G W (Wagner Virginia) 53 Mayals Ave
Swansea Wales G 53-54 M-ED 54
MAYER Paul G W 53 Mayals Ave Swansea Wales
G 53-57 MS 55 PHD 57
MAYER Mrs Richard J (Kleiman Rima) 100 Prospect
Ave Hackensack N J 07601 55C 51-55 AB 55
MAYER Richard J 100 Prospect Ave Hackensack N J
07601 54C 50-55 B CHEM E 55
MAYER Richard J 8902-98 St Woodhaven N Y 11421
53C 49-58 BCE 58
MAYER Robert A 62 Longview St West Orange N J
07052 58C 54-58 AB 58
MAYER Robert G 1010 Clinton St Philadelphia Pa
19147 60C 56-60 AB 60
MAYER Robert J 175 E 79th St Apt 15a New
York N Y 10021 G 50-54 LLB 54
MAYER Mrs Robert W (Slaght Eugenia) Washington
Mountain Rd Becket Mass 01223 42C 38-42 BS
HE 42

Supplied by Rocappi Inc.

Alessi S C Jr
Anderson D T
Anderson J B
Beal C M
Bentley G E
Blasdell C V
Bolan Mrs R P
Brookmire P R
Brown Dr C E
Brown Mrs K G
Brown K G
Button Mrs K B
Calamungi J T
Carlson N P
Cline G W
Coe A J
Connelly A M
Crissey H E
Crozier P H
Davis R L
Dennis F J
Edson Mrs S S
Edson S S
Engstrom J E
Erickson Mrs W T
Estabrook F F
Filmer F F
Finley J C
Forbes Mrs H P Jr
Ford A G
Garifi N J
Garmezy R H
Graham R C Sr
Greenwood Mrs H P
Hall C M
Harden G L
Himebaugh L B Jr
Howard R M
Johnson J B
Kayner D C
King G M
Kocher B P
Lanning C E
Law Mrs D
Leet E D
Levin D E
Young N L
Zimmer R D

Jamesville
Bamerick J K
Bishop F A Jr
Brown W D
Collum Mrs E B
Conklin Miss J F
Coye Mrs D W
Coye D W
Craner B N
Craner W N
Fine Mrs E H
Flower D S
Haffenden G E
Hughes C R
Hummer Mrs R
Iannaccone V J
Kenney J W
McKnight Mrs D G
Moshier E G
Moyer R V
Payne H H
Ryan J A
Smith R E
Stoker B W
Todd J L
Williams Mrs M H
Williams M H
Wills Mrs K P

Jasper
Cornell P W
Dennis Mrs R G
Dennis R G
Kelley Mrs I
Leach W R
Loper J J

Jefferson
Buck C D
Decker Miss S D
Hait H J
Peake Mrs R K
Treadwell M F
Knapp H L
Landow Mrs B E
Matz D M
Maxian T R
McCann Miss M C
McGuigan Mrs F T
Merena R N
Moore Rev J H
Moore Mrs J H
Neill R B
Penton Mrs P
Penton P
Sampson G G Jr
Shuba D J
Steed Dr D J
Stibrany L R
Stover F T III
Stover R L
Sulich J Jr
Sullivan J F
Thomas D L
Walter H L
Wright Mrs W C
Wright W C
Zevan Mrs G

Johnsonville
Cornell Mrs H E
Littman Dr H
Pickett Mrs J H
Wiley P H

Johnstown
Ahearn J J
Arnsfield S R
Barlow M K
Boyd Mrs P L Jr
Brewda Mrs M
Buell H J
Charles Mrs W W
Cole Mrs A A
Cross D C
Dodd R H
Drumm Miss S M
Felthousen K E
Gragg W L
Hargan R P
Hochman Dr S
Kelleher J P
Kellogg D R
Kempson J W Jr
Longenecker A R
Lopez F G Jr
Maas Miss M J
Merrill H F
Mickel A T
Miller Mrs G
Orvis W D
Quick A D
Ross Mrs D G
Ross D G
Rubenstein L C
Schurman G M
Schwarz R J
Stamirowski G
Tsui R T
Tveter R C
Wanlass Dr S A Jr
Williams Mrs G C
Williams G C

Keene
Nadler Mrs A P
Nadler A P

St. Huberts
Felshow E R

Keene Valley
Luck M A
Trumbull A R

Keeseville
Bull Mrs H G
Finley C W
Gordon W P
Ingebritsen O C
Long Mrs E W
McGuire Mrs R Q
McKee Miss M H
Sullivan C M
Taylor F D
Estey Miss J D
Ewart Mrs J N
Ewart J N
Finnigan T J
Fish J A
Forster A G
Funk Mrs W G
Gilbert Miss H V
Goodno R W
Gould C M
Gragg W B
Greene T W
Gruen D H
Hackett J K
Hadden N J
Hartman Miss M C
Hastings R E Jr
Hayes Miss L R
Hayman R C
Heiss Mrs R H Jr
Herd Dr J K
Hermann L F
Higgins J M
Hilary H R
Hilary R B
Hiler A G
Hoepfinger M T
Hoffman Mrs E G
Hollister E Jr
Hood Mrs A S
Howard S M
Huber H L
Innerfield Mrs I L
Inskip Mrs G R
Inskip G R
Jorgensen R
Joslin Mrs N E
Joslin N E
Karet Mrs H M
Kaunitz Dr V H
Keller H R
Keller L A
Kellner Miss J A
Koeppel K V
Laird Miss V J
Lapp Mrs R G
Lindquist Mrs G R

Kenoza Lake
Allen P H
Bryant Mrs T V
Bryant T V
Gempler J K
Winkelstern Mrs G

Kent
Bannister L R D
Bennett C I
Cliff H D
Heidemann Miss D J
Smith J N

Kerhonkson
Berkey Miss I
Berkey R A
Cohen A J
Davis H W
Davis P H
Davis Mrs P H
Fredd L C
Friedman B
Geller A N
Holloway Dr R G
Levine S
Morgan Mrs M E

Keuka Park
Austin Miss V J
Bennett Miss J
Compton Mrs B C
Davison R J
Guthrie R G
Shively Mrs A S
Vine Mrs V
White Miss M L
White Miss R L
Wilkes R S

Kew Gardens
Bennett Mrs J D
Berger A
Berkan Dr H S

Supplied by Rocappi Inc.

92 HAL
Keating, Lawrence A. **$3.95**
Fleet Admiral: the story of William F. Halsey. Westminster, 1965.
Sr. High
Begins with Pearl Harbor and ends with the signing of the Japanese surrender on Admiral Halsey's flagship, the *Missouri*.
LJ

HAMILTON, ALEXANDER

92 HAM
Cooke, Jacob E., ed. **$5.45**
Alexander Hamilton: a profile. Hill and Wang, 1967. (American profiles)
Sr. High
Thirteen scholars and historians give their estimates of Hamilton's personality, political creed, policies, programs, and influence on American history.
BS, K, LJ, T

92 HAM
Miller, John C. **$8.49**
Alexander Hamilton; portrait in paradox. Harper, 1959.
Sr. High
Explores the thinking and experiences of one of America's greatest statesmen, who was also a fascinating and sometimes devious human being.
A, HN, PL

HANCOCK, JOHN

92 HAN
Wagner, Frederick **$3.80**
Patriot's choice; the story of John Hancock. Dodd, 1964.
Jr. High
A convincing portrait of the man behind the bold signature on the Declaration of Independence, this is also a brief history of the period in which he lived.
A, J, LJ, NYT

HANCOCK, WINFIELD SCOTT

92 HAN
Tucker, Glenn **$5.49**
Hancock the superb; maps by Dorothy Thomas Tucker. Bobbs, 1960.
Jr. High
Modern biography of one of the great Union generals in the Civil War, Winfield Scott Hancock.
A

HANNIBAL

92 HAN
Cottrell, Leonard **$5.12**
Hannibal, enemy of Rome. Holt, 1961.
Sr. High
First pub. 1960 in England with title: *Enemy of Rome*. The drama of Hannibal's proposed plan to destroy Rome in 216 B.C. is presented with vividness and authenticity. The haz-

Supplied by Rocappi Inc.

RUBINSTEIN-WEAVER—Frameworks of Exposition

By S. Leonard Rubinstein and Robert G. Weaver, both of *The Pennsylvania State University*

A concise rhetoric of expository writing which focuses on organization and content, emphasizing practical, informative, factual writing. Contains ample and diverse illustrative and exercise material. Uses the question and answer method of development within each chapter with the answers to one question posing the succeeding question.

CONTENTS: Preface; Foundation: Exposition; Framework One: Definition; Framework Two: Classification and Partition; Framework Three: Analysis of a Process; Framework Four: Analysis of a Device; Framework Five: Interpretation; Framework Six: Evaluation by Standards; Framework Seven: The Statement of a Problem; Framework Eight: Summary and Paraphrase; A Completed Structure: The Investigative Report; Index.

03-050960-2

1965 192 pp. $3.25 paper

SAWYER-LUBBE—From Speech to Writing

By Janet Sawyer and Louise Lubbe, both of *Long Beach State College*

This syntactic grammar text emphasizes the structural approach to grammar and the difference between normal speech patterns and the requirements of formal prose.

CONTENTS: Introduction. Basic Patterns of English, Nominals and Nouns. Verbals and Verbs. Auxiliaries and Verb-Auxiliaries. Other Nominal Positions. The Adjective and Adjectival: Specific Modifiers. The Adverb and Adverbial: General Modifiers; Subordination of Basic Patterns. Infinitive and Participle Phrases. Coordination and Other Elements of Style. Appendix A—Exercises: Analyses. Appendix B—List of Irregular Verbs.

03-054685-0

1966 288 pp. $3.95 paper

TAFT-McDERMOTT-JENSEN-KAPLAN—The Technique of Composition, Fifth Edition

By Kendall B. Taft, Emeritus, *Roosevelt University*, John Francis McDermott, *Southern Illinois University*, Dana O. Jensen, *Washington University*, and Charles Kaplan, *San Fernando Valley State College*

CONTENTS: The Mechanics of Writing: The Sentence—Structure Determines Meaning; Words in Sentences—"The Consort Dancing Together"; Punctuation—Pointing Up Meaning; Mechanics—The Etiquette of Composition; Language and Usage—Words, Words, Words; Style—Proper Words in Proper Order; The Paragraph—Organization and Development; Organization—The Whole Theme. The Forms of Writing: Exposition; Argument; The Precis; The Research Paper; Examinations and Book Reports; Letters.

03-009730-4

1960 654 pp. $6.95

WATT—An American Rhetoric, Third Edition

By William W. Watt, *Lafayette College*

A chapter on the English language, a model paper on "The War of Webster's Third" in the chapter on the research paper, and new material on paragraphing, style, and tone are the major features of this edition. Extensive changes have been made in the chapter on the dictionary and in the Glossary of Usage.

CONTENTS: Preface. A Guide to Good Writing: Good Writing and Correct English; Getting Under Way; Organizing and Developing; Sentences; What's in a Word?; Words in Action; Style and Tone; Clear and Cloudy Thinking; The Library Research Paper. The Backgrounds of English: The English Language—A Brief History. A Review of Mechanics: Grammar; Punctuation; Spelling. A Glossary of Usage.

03-045770-x

1964 640 pp. $6.95

★WEAVER—A Concise Handbook of English

By Richard M. Weaver

This brief, succinct handbook contains descriptive accounts of standard usage and is a positive approach to good composition. Within each of the first three sections—Grammar, Punctuation, Spelling—each rule or guideline is stated, followed by examples illustrating the correct form and noting confusing exceptions. The final section—The Glossary of Usage—treats words or phrases most frequently misused, giving formal, acceptable, unacceptable, and colloquial usage for each item. A correction symbol guide is printed on the inside cover of the book.

CONTENTS: *Grammar:* The Parts of Speech. Sentences. Some Problems of Grammar and Syntax. *Punctuation:* Terminal Marks of Punctuation. Internal Marks of Punctuation. Other Uses of Punctuation. Mechanics. *Spelling:* A List of Words Often Misspelled. *A Glossary of Usage.*

03-080495-7

January 1969 96 pp. $1.50 paper

WEAVER—Rhetoric and Composition: A Course in Writing and Reading, Second Edition

By Richard M. Weaver

This edition, in an entirely new format and new design, offers a complete course in composition: rhetoric, readings, a brief handbook, and numerous exercises. The study of rhetoric is stressed, with particular attention to argumentation and persuasion and with emphasis on what the writer can do rather than what he should avoid. The handbook is a concise reference section on the mechanics of clear

Supplied by Rocappi Inc.

CHAPTER 6

Testing the Student's Ability to Apply Knowledge in New Situations, to Analyze Information, and to Synthesize Data

In Chapter V, we discussed the two lowest levels of learning: 1.00, *Knowledge*, and 2.00, *Comprehension*. A few examples of test questions designed to measure these learning levels were presented. In this chapter, we will discuss the next three levels of learning: 3.00, *Application*, 4.00, *Analysis*, and 5.00, *Synthesis*.

3.00 APPLICATION

What is meant by the student's ability to apply his knowledge can be illustrated by a type of situation met by most teachers in one form or another almost every teaching day. John has learned (understands) how to solve the division and multiplication problems in Exercises 1 and 2. In Exercise 3, the author mixes the two types of problems. John now turns to the teacher and asks, "Do I divide or multiply?" This happens even though John has just demonstrated that he can work virtually identical problems in Exercises 1 and 2.

Although such an experience is very frustrating to teachers, it can also be very revealing. On the one hand, it should reveal to us that the child not only *knows* but also *understands* how to do problems when he is told what principle or abstraction to apply. On the other hand, the child cannot as yet decide which one to apply unless the particular abstraction or operation has been identified for him. Being able to decide *what to do* is a higher form of learning than knowing or understanding. This ability is of vital concern to us. We know that it is not enough for John to be able to work the problem only after we

Supplied by Rocappi Inc.

4.57	43.0	14.5	100	75	50	β-$C_{57}H_{71}O_6$	beta Triolein	5-0273
4.51	42.0	3.80	95	100	100	$C_{28}H_{54}MgO_4$	Magnesium Myristate	5-0015
4.55	41.0	13.5	100	100	90	δ-$C_{16}H_{31}NaO_2$	delta Sodium Palmitate	2-0003
4.53	32.0	3.62	100	150	40	$C_{20}H_{38}MgO_4$	Magnesium Caprate	5-0005
4.56	28.5	4.14	100	350	98	$C_{20}H_{38}BaO_4$	Barium Caprate	5-0004
4.58	25.5	17.1	100	80	80	$C_{21}H_{40}O_4$	1-Elaidylglycerol	8- 583
4.52	23.7	3.89	70	250	100	$C_{16}H_{30}BaO_4$	Barium Caprylate	5-0014
4.50	22.7	4.10	20	100	100	α-$C_{10}H_{20}O_2$	alpha Capric Acid	8- 527
4.59	19.2	3.29	60	200	100	$C_6H_{11}KO_2$	Potassium Caproate (A-phase, at 75 dg C)	8- 785
4.50	17.7	8.84	60	100	32	$C_{18}H_{32}CaN_2O_{10}$	Calcium Pantothenate	5-0039
4.51	17.0	8.50	50	100	80	$C_{15}H_{23}NO$	Pelargonanilide	3-0006
4.56	16.6	11.1	100	100	100	$C_{21}H_{42}O_4$	1-Stearylglycerol	8- 589
4.53	16.1	5.04	53	100	100	$C_{13}H_{16}BrN_2NaO_4S_2$	Sodium β-Bromoallylmercaptomethyl Penicilli	5-0035
4.58	15.0	5.26	100	80	80	$C_{57}H_{104}O_6$	Trielaidin (beta phase)	8- 592
4.51	14.9	4.70	70	100	40	$C_{13}H_{14}N_2O_6$	Cyclopentylmethanol 3,5-dinitrobenzoate	13- 785
4.54	14.8	3.96	40	100	27	$C_6H_5NaO_2S.2H_2O$	Sodium Benzenesulfinate Hydrate	5-0058
4.50	14.8	2.33	100	80	70	$C_{13}H_{20}N_2O_6S$	d-Glucose thiobenzohydrazide	9- 774
4.54	14.5	2.74	100	70	40	$C_6H_{13}NO_2$	l-Leucine	5-0274
*4.56	14.2	4.06	60	100	70	$C_{16}H_{15}KO_4$	Potassium Hydrogen Biphenylacetate	13- 615
4.59	14.0	4.07	20	100	15	$C_7H_{13}KOS_2$	1-Hexylxanthate Potassium	9- 699
4.53	13.8	3.92	100	100	67	$C_{36}H_{70}O_4Zn$	Zinc Stearate	5-0079
4.50	13.7	4.90	50	100	70	$C_6H_{13}NO$	Isocaproamide	4-0074
4.52	13.3	4.18	100	50	50	$C_{19}H_{36}O_2$	cis-11,12-Methylene octadecanoic Acid (form B)	15- 997
4.57	13.2	5.21	80	100	100	$C_{16}H_{16}O_4S_2$	2,5-Diphenyl-p-dithiane-1,4-tetroxide	13- 728
4.56	13.1	4.04	30	100	30	$C_6H_{13}NO_2$	dl-Isoleucine	5-0078
*4.56	12.8	4.26	100	60	40	$C_{13}H_{12}N_2S$	sym-Diphenylthiourea	11- 799
4.55	12.5	4.85	24	100	48	$C_{10}H_{18}O_4Zn.2H_2O$	Zinc Valerate Hydrate	1-0025
4.57	12.2	4.04	40	100	40	$C_6H_{11}KOS_2$	1-Pentylxanthate Potassium	9- 681
4.55	12.0	4.37	100	100	85	$C_{48}H_{36}O_4Si$	Tetrakis(p-phenoxyphenyl)silane	9- 866
4.58	12.0	3.84	100	80	80	$C_{45}H_{86}O_6$	1-Palmityl-2-myristyl-3-lauryl-glycerol(β phase)	8- 595
4.54	11.5	14.0	100	75	50	$C_{35}H_{60}O_{13}$(q)	Fungichromin	13- 908
4.55	10.5	4.29	100	100	100	$C_{20}H_{40}Cl_2O_{20}U.6H_2O$	Dioxane Uranyl Perchlorate Hydrate	14- 880
4.55	10.4	6.16	63	100	100	$C_{27}H_{33}N_3O_7S$	Ethyl tyrosine salt of Penicillin-G	5-0088
4.51	10.3	8.47	100	80	80	$C_{12}H_{10}N_2O_2$	2-Nitrodiphenylamine	3-0181
4.57	10.3	5.15	100	100	100		Ammonia Cellulose	3-0022
4.51	10.3	4.11	100	40	40	$C_{42}H_{32}O_3Si$	Phenyltris(p-phenoxyphenyl)silane	9- 865
4.59	10.0	13.7	80	100	80	$C_{17}H_{34}O_4$	1-Myristylglycerol	8- 586
*4.57	10.0	5.26	55	100	50	$C_{12}H_{22}O_6$	1,1'-Dihydroperoxydicyclohexylperoxide-1,1'	10- 538
4.52	9.98	3.20	85	100	50	$C_{22}H_{28}N_2O_2Zn$	bis(N-butylsalicylaldimine)zinc(II)	15-1158
*4.50	9.90	3.61	100	100	70	$C_{15}H_{29}Br_2N$	2-Bromo-N,N-dicyclohexyl-n-propylamine HBr	14- 917
4.55	9.77	4.90	100	80	60	$C_{21}H_{26}N_2O_3$	Epi-α-Yohimbine	13- 654
4.56	9.70	8.30	30	40	40	See 19.5 14.7 11.7 100 60 60	Silver Behenate	4-0048
4.58	9.57	6.85	100	80	60	See 47.7 15.9 24.0 600 170 150	Barium Stearate	9- 848
4.51	9.52	3.99	100	80	60	$C_{10}H_{13}N_5$	5-(Ethylbenzyl)-aminotetrazole	8- 654
4.57	9.50	12.0	90	100	90	$C_{17}H_{33}AgO_2$	Silver Margarate	4-0101
4.50	9.50	5.20	15	100	38	$C_6H_{10}FeO_6.3H_2O$	Iron(II) Lactate Hydrate	1-0060
4.59	9.30	3.49	40	100	40	$CH_3KO_4S.1/2H_2O$	Potassium Methyl Sulfate Hydrate	14- 730
4.57	9.28	4.15	100	80	70	$C_{20}H_{13}N_3O_6$	Anthracene 1,3,5-trinitrobenzene	14- 878
4.52	9.11	3.76	100	100	100	$C_{11}H_{16}ClN_5.HCl$	1-p-Chlorophenyl-5-isopropylbiguanide HCl	5-0115
°4.55	9.00	4.35	100	100	100		Pneumococcus Specific Polysaccharide (type VI)	13- 827
4.53	9.00	3.03	100	95	80	$C_{14}H_{10}$	Anthracene	4-0300
*4.50	8.99	5.48	55	100	70	$C_{12}H_{22}CaO_{14}$	Calcium Gluconate (Form II)	10- 774
*4.55	8.88	4.97	70	100	65	$C_7H_{14}O_6$	α-Methyl-d-glucoside	14- 946
4.59	8.79	3.45	18	20	20	See 22.0 14.6 11.0 100 80 20	Silver Palmitate (20 deg C)	4-0030
4.56	8.77	4.37	100	100	100	$C_{21}H_{26}N_2O_3$	Rauwolscine	13- 656
4.56	8.76	7.08	35	100	35	$C_{21}H_{15}N_3O_6$	Trinitrotoluene anthracene	13- 777
4.59	8.75	3.48	18	20	20	See 21.4 14.5 10.9 100 80 20	Silver Palmitate (78 deg C)	4-0034
4.59	8.63	6.06	40	100	40	$C_{32}H_{41}N_5O_5$	Ergokryptinine	9- 685
4.57	8.62	3.52	96	100	87	$C_{13}H_{13}N_3O_5S_2$	Sulfasuxidine (form I)	5-0117
4.53	8.50	3.89	80	90	70	See 14.1 10.6 8.5 100 90 90	Silver Pentadecylate	4-0071

Supplied by Rocappi Inc.

MIO-PRESSIN® Trademark

No. 1 and No. 2

For the treatment of moderate to severe hypertension ℞

COMPOSITION

'Mio-Pressin' is available in two dosage strengths:

Each 'Mio-Pressin' No. 1 (half strength) capsule contains:

Powdered rauwolfia serpentina	12.5 mg.
Protoveratrine	0.1 mg.
Dibenzyline®	2.5 mg.

(brand of phenoxybenzamine hydrochloride)

Each 'Mio-Pressin' No. 2 (standard strength) capsule contains:

Powdered rauwolfia serpentina	25 mg.
Protoveratrine	0.2 mg.
Dibenzyline	5 mg.

(brand of phenoxybenzamine hydrochloride)

ACTION AND USES

Particularly indicated for the treatment of moderately severe to severe hypertension. 'Mio-Pressin' offers these advantages: (1) *Gradual lowering of blood pressure (This gradual response over a period of 4-7 weeks allows the patient's circulatory system time to readjust to changed conditions.);* (2) *Few adverse reactions.*

CONTRAINDICATIONS

Because of its rauwolfia content, maintenance doses of 'Mio-Pressin' higher than twelve capsules of No. 1 or six capsules of No. 2 per day are contraindicated in patients with peptic ulcer, ulcerative colitis, or depression, or in patients with a history of these conditions. Patients in whom depression is suspected should be followed carefully and responsible members of their families should be instructed to be on the alert for any signs of depression.

PRECAUTIONS

If possible, 'Mio-Pressin' therapy should be discontinued for two weeks prior to elective surgery, since certain anesthetic agents potentiate the hypotensive action of rauwolfia.

ADVERSE REACTIONS

Side effects with 'Mio-Pressin' are generally mild. Some patients, however, may develop nasal stuffiness, fatigue and other reactions associated with antihypertensive drugs. Adjustment of 'Mio-Pressin' dosage will usually control such reactions.

See also Dibenzyline (phenoxybenzamine hydrochloride, SK&F) Adverse Reactions section.

ADMINISTRATION AND DOSAGE

The dosage range with 'Mio-Pressin' is wide and the effective dose for each patient must be determined individually.

In mild and moderate hypertension, the initial dose should usually be one capsule of 'Mio-Pressin' No. 1, three or four times a day. *Severe cases* may be started on the same number of 'Mio-Pressin' No. 2 capsules.

This initial dose should be maintained for at least two weeks, since the therapeutic effect of 'Mio-Pressin' develops slowly. If the desired effect has not been achieved in this time, the daily dose may be increased by two or three capsules at weekly intervals until the response is satis-

Supplied by Rocappi Inc.

MIO-PRESSIN Trademark
No. 1 and No. 2 ℞

For the treatment of moderate to severe hypertension

COMPOSITION
'Mio-Pressin' is available in two dosage strengths:

Each 'Mio-Pressin' No. 1 (half strength) capsule contains:

Powdered rauwolfia serpentina	12.5 mg.
Protoveratrine	0.1 mg.
Dibenzyline®	2.5 mg.

(brand of phenoxybenzamine hydrochloride)

Each 'Mio-Pressin' No. 2 (standard strength) capsule contains:

Powdered rauwolfia serpentina	25 mg.
Protoveratrine	0.2 mg.
Dibenzyline	5 mg.

(brand of phenoxybenzamine hydrochloride)

ACTION AND USES
Particularly indicated for the treatment of moderately severe to severe hypertension. 'Mio-Pressin' offers these advantages: (1) *Gradual lowering of blood pressure (This gradual response over a period of 4-7 weeks allows the patient's circulatory system time to readjust to changed conditions.);* (2) *Few adverse reactions.*

CONTRAINDICATIONS

Because of its rauwolfia content, maintenance doses of 'Mio-Pressin' higher than twelve capsules of No. 1 or six capsules of No. 2 per day are contraindicated in patients with peptic ulcer, ulcerative colitis, or depression, or in patients with a history of these conditions. Patients in whom depression is suspected should be followed carefully and responsible members of their families should be instructed to be on the alert for any signs of depression.

PRECAUTIONS
If possible, 'Mio-Pressin' therapy should be discontinued for two weeks prior to elective surgery, since certain anesthetic agents potentiate the hypotensive action of rauwolfia.

ADVERSE REACTIONS
Side effects with 'Mio-Pressin' are generally mild. Some patients, however, may develop nasal stuffiness, fatigue and other reactions associated with antihypertensive drugs. Adjustment of 'Mio-Pressin' dosage will usually control such reactions.

ADMINISTRATION AND DOSAGE
The dosage range with 'Mio-Pressin' is wide and the effective dose for each patient must be determined individually.

In mild and moderate hypertension, the initial dose should usually be one capsule of 'Mio-Pressin' No. 1, three or four times a day. *Severe cases* may be started on the same number of 'Mio-Pressin' No. 2 capsules.

Supplied by Rocappi Inc.

VISCOSITY INDEX FROM KINEMATIC VISCOSITY

5.40 to 5.49 cs at 210F

0 to 50 V.I.

V.I.	KINEMATIC VISCOSITY AT 210F, cs									
	5.40	5.41	5.42	5.43	5.44	5.45	5.46	5.47	5.48	5.49
	KINEMATIC VISCOSITY AT 100F, cs									
0	50.61	50.81	51.01	51.21	51.41	51.61	51.81	52.01	52.21	52.41
1	50.45	50.65	50.85	51.04	51.24	51.44	51.64	51.84	52.04	52.24
2	50.28	50.48	50.68	50.88	51.08	51.28	51.47	51.67	51.87	52.07
3	50.12	50.32	50.52	50.71	50.91	51.11	51.31	51.50	51.70	51.90
4	49.96	50.16	50.35	50.55	50.74	50.94	51.14	51.33	51.53	51.73
5	49.80	49.99	50.19	50.38	50.58	50.77	50.97	51.16	51.36	51.55
6	49.63	49.83	50.02	50.22	50.41	50.61	50.80	50.99	51.19	51.38
7	49.47	49.66	49.86	50.05	50.25	50.44	50.63	50.83	51.02	51.21
8	49.31	49.50	49.69	49.89	50.08	50.27	50.46	50.66	50.85	51.04
9	49.15	49.34	49.53	49.72	49.91	50.10	50.30	50.49	50.68	50.87
10	48.98	49.17	49.37	49.56	49.75	49.94	50.13	50.32	50.51	50.70
11	48.82	49.01	49.20	49.39	49.58	49.77	49.96	50.15	50.34	50.53
12	48.66	48.85	49.04	49.22	49.41	49.60	49.79	49.98	50.17	50.36
13	48.49	48.68	48.87	49.06	49.25	49.43	49.62	49.81	50.00	50.19
14	48.33	48.52	48.71	48.89	49.08	49.27	49.45	49.64	49.83	50.01
15	48.17	48.36	48.54	48.73	48.91	49.10	49.29	49.47	49.66	49.84
16	48.01	48.19	48.38	48.56	48.75	48.93	49.12	49.30	49.49	49.67
17	47.84	48.03	48.21	48.40	48.58	48.76	48.95	49.13	49.32	49.50
18	47.68	47.87	48.05	48.23	48.41	48.60	48.78	48.96	49.15	49.33
19	47.52	47.70	47.88	48.07	48.25	48.43	48.61	48.80	48.98	49.16
20	47.36	47.54	47.72	47.90	48.08	48.26	48.44	48.63	48.81	48.99
21	47.19	47.37	47.56	47.73	47.92	48.09	48.28	48.45	48.64	48.82
22	47.03	47.21	47.39	47.57	47.75	47.93	48.11	48.29	48.47	48.65
23	46.87	47.05	47.23	47.40	47.58	47.76	47.94	48.12	48.30	48.47
24	46.71	46.88	47.06	47.24	47.42	47.59	47.77	47.95	48.13	48.30
25	46.54	46.72	46.90	47.07	47.25	47.43	47.60	47.78	47.96	48.13
26	46.38	46.56	46.73	46.91	47.08	47.26	47.43	47.61	47.78	47.96
27	46.22	46.39	46.57	46.74	46.92	47.09	47.27	47.44	47.61	47.79
28	46.05	46.23	46.40	46.58	46.75	46.92	47.10	47.27	47.44	47.62
29	45.89	46.07	46.24	46.41	46.58	46.76	46.93	47.10	47.27	47.45
30	45.73	45.90	46.08	46.25	46.42	46.59	46.76	46.93	47.10	47.28
31	45.57	45.74	45.91	46.08	46.25	46.42	46.59	46.76	46.93	47.11
32	45.40	45.57	45.75	45.91	46.09	46.25	46.42	46.60	46.76	46.93
33	45.24	45.41	45.58	45.75	45.92	46.09	46.26	46.43	46.59	46.76
34	45.08	45.25	45.42	45.58	45.75	45.92	46.09	46.26	46.42	46.59
35	44.92	45.08	45.25	45.42	45.59	45.75	45.92	46.09	46.25	46.42
36	44.75	44.92	45.09	45.25	45.42	45.58	45.75	45.92	46.08	46.25
37	44.59	44.76	44.92	45.09	45.25	45.42	45.58	45.75	45.91	46.08
38	44.43	44.59	44.76	44.92	45.09	45.25	45.41	45.58	45.74	45.91
39	44.26	44.43	44.59	44.76	44.92	45.08	45.25	45.41	45.57	45.74
40	44.10	44.27	44.43	44.59	44.75	44.91	45.08	45.24	45.40	45.57
41	43.94	44.10	44.27	44.42	44.59	44.75	44.91	45.07	45.23	45.39
42	43.78	43.94	44.10	44.26	44.42	44.58	44.74	44.90	45.06	45.22
43	43.61	43.78	43.94	44.09	44.25	44.41	44.57	44.73	44.89	45.05
44	43.45	43.61	43.77	43.93	44.09	44.24	44.40	44.57	44.72	44.88
45	43.29	43.45	43.61	43.76	43.92	44.08	44.24	44.40	44.55	44.71
46	43.13	43.28	43.44	43.60	43.76	43.91	44.07	44.23	44.38	44.54
47	42.96	43.12	43.28	43.43	43.59	43.74	43.90	44.06	44.21	44.37
48	42.80	42.96	43.11	43.27	43.42	43.57	43.73	43.89	44.04	44.20
49	42.64	42.79	42.95	43.10	43.26	43.41	43.56	43.72	43.87	44.03
50	42.48	42.63	42.79	42.94	43.09	43.24	43.40	43.55	43.70	43.86

Supplied by Rocappi Inc.

INDEX

abridging, savings through, 38
abstracting, 37
aesthetics of computer composition, 37
Air Force study (Rome Air Force Base), 101
airlines, application of computer typesetting to, 83
Algol, 48
alphabetization, 68–69
Alphanumeric, 108
Alphanumeric CRT, 81
Alphatype, 93
alterations, author's, *see* author's alterations
American Bar, 73
American Broadcasting Co., 106
American Can Co., 106
American Chemical Society, 105
American Educational Publishing Co., 106
American Medical Association, 87
American Society for Testing Materials, 74
Arcata National Corp., 106
art work, 95
assembly language, 48
Astrocomp, 61
author-created input, 61
author's alterations, 23, 36, 38, 61, 63
Automatech, 75, 108
automatic indexing, 85

Barnett, Prof. Michael, 19
basic assembly language, 48
belt press, 12, 60
Bible, computer typesetting of, 74
bibliographical data, 86, 88
biographical data, 86, 88
Black Dot, 106
book catalogs, 70, 86
book composition, 57
book design, economies in, 59
book listings, 86
book production, 1967, 8
Books in Print, 87
Bowne & Co., 97
Boyle, John, 77
break-even point (for computer installation), 32
Business Week, computer typesetting of, 27

Cameron (belt) press, 12, 60
car registration information, 86
carding, 41
cast-off process, 59
catalog entries, 70
catalogs and cataloguing, 70
cathode ray tube(s) *see* ORT
central processing unit, 46
chain printer, 26, 79
change, adaptation to, 91
change, origins of, 7
changes, cost of, 40
character-generating equipment, 53
Character Generation Committee (of PIA), 51
character set, problems of, 85, 100
Chemical Abstracts, 105
Chester County (Pa.) Library, 70
Clearinghouse for Federal Scientific and Technical Information, 79
Cobol, 48, 49
cold composition, 14, 22

college bulletins, 84
Columbia Broadcasting System, 106
COM systems, 82
command codes, 23
communicating systems, 27
communication, problems of, 113
competition, from outside the industry, 104
compiler language, 48
Composition and Retrieval Technology, Inc., 97
composition, book, 57
composition, demand for, 10
composition devices, high-speed, 24
composition industry, unique position of, 17
Composition Information Services, 107, 116, 119
compositors, hand, 24
Compugraphic, 57
computer composition, acceptance of, 91
Computer Composition, Inc., 108
computer configurations, 51
computer costs, 51
computer filing, 66–69
Computer Graphics, 97
computer hardware, 43
computer languages, 48
computer passes, 24, 53
computer printout, 25, 58, 86
computer programs, 21–28
computer software, 43
computer systems, 19
computer, systems demands on, 102–103
computer time required, 102
computer utilization, 31, 43
computerized composition systems, 19
computers, general purpose, 25
computers, numbers of, 79
computers, special purpose, 25
Computype, 108
copy-cutting, 33
copy editing, 36
copy fitting, 27, 28, 37, 55
core, 20, 22, 42, 48, 50
Cornell University, 87
correction procedures, savings from, 34
corrections and correcting, 21, 22, 23, 34, 36, 39, 58, 63
cost factors, 10, 29 ff.
cost of composition, 13
costs of programming, 33
cottage industry input, 97
CRT, 7, 8, 22, 28, 37, 41, 42, 55, 58, 79 80, 81, 82, 86, 89, 93
CRT display consoles, 28
cumulation of data, 70
CUSIP, 87
customers' expectations, knowledge of, 15

data base, 74
data centers, 104
Data Central, 62
data cumulation, 70
data explosion, 71
data processing, 64
data transmission, 101
Datagraphics, 87, 106, 108
Datatext, 26, 28, 61
demand for printing, 9
descriptors, thesaurus of, 74
dictionary, 34
dictionary look-up, 20, 34
direct keyboarding, 35
directories, 65, 72
Dissly Systems, 61
distributors, application of computer typesetting to, 83
documentation, 88
Donnelley, R.R., 27, 108
drugs and pharmaceuticals, 87
Dun & Bradstreet, 106
Dycril plates, 12

economies in keyboard shorthand, 33
editing, 23, 53
editing systems, 60
edit-insert programs, 80
editions, subsequent, 40
editorial computerization, 60
editorial input, 65
editorial participation, 28
editorial revisions, 27
editorial savings, 28
EDUCOM, 72
Encyclopaedia Britannica, 73, 82
equipment reliability, 112
error correction, 23
error diagnosis, 23
errors in input, 63
esthetic review, 37
explosion of data, 66, 70
external storage devices, 46
extraction, 65, 73

Fairchild, 57
file updating, 35
filing by computer, 65–69
film composition, cost of corrections, 34
floor men, 24
flow of work, 32
font changes, 53
footnotes, moving, 42
format, 23, 99
Forster, Reginald Bishop, 73
Fortran, 48
Fotosetter, 11, 93
Fototronic, 55
Fototronic CRT, 41, 94
function codes, 23

Gardner, Arthur E., 107
General Electric Co., 105
General Learning Corp., 105
general purpose computers, 24, 25
Government Printing Office (GPO), 76, 77, 105, 107
GPO, *see* Government Printing Office
Grace plate, 13
Graphic Services, 108
graphics, 94

hand compositors, 24
hard copy, 23
hardware, 45
Harmon, George, 82
Harris Fototronic 1200, 28
Harris-Intertype, 41
Harris, Jessica L., 68
Hattery, Lowell, 91
Heath, D.C., 106
high-speed composition devices, 24, 94
high-speed typesetting systems, 43
Hines, Theodore C., 68
Holt, Rinehart & Winston, 106
Honeywell, 31
hot metal, 11, 19
hot metal, limitations of, 14
hot metal programs, 22
hot metal systems (one-pass), 19
hyphenation, 20, 29, 52
hyphenless justification, 25, 29

IBM, 106
IBM 1620, 19
IBM 2680, 81, 94
IBM Selective typewriters, 61
IEEE, 77, 91
Index Medicus, 87
indexes, 65
indexing, 37, 65
indirect keyboarding, 29
Information Centers, 87
information, exponential growth of, 9
information retrieval, 88
initial input, information needed, 98
input changes, 96
input cost, 90
input devices, 46
input errors, 65
input failures, 26
Institute for Scientific Information, 87
International Computaprint, 104, 108

justification, 20, 29, 52
justification, hyphenless, 25, 29
justified type, 20

kerning, 52
keyboard operators, number required, 100
keyboard shorthand, economies in, 33
keyboarding costs, 30
keyboarding, indirect, 29
keyboarding mistakes, 21, 34, 63
keyboards, off-line, 96
keyboards, on-line, 96
Kingsport Press, 106
knowledge centers, *see* information centers
knowledge industry, 7
KWIC index, 85

leading, 41, 55
leading, reverse, 58
letterpress plate (flexible), 13
Lewis, Wilmott, 13
librarians, 88
library applications, 70
Linasec, 29
line and half-tone composition, 95
Linofilm, 55
Linofilm Quick, 55, 57
Linotron 505, 94
Linotron 1010, 42, 61
Linotype, 20

machine language, 48
machinery, depreciated, as deterrent to modernization, 17
macro codes, 60

makeup, 13, 23, 29, 95
makeup, *see also* pagination
Malt, Mrs. Lillian, 30
Malt-Pitman, 30
market for computer printout, 79–80
market studies, 86
markets, computer-created, 75
markets, new, 64
McCall Corp., 96, 106
McGraw-Hill, 28, 72
Medlars, 75
memory, *see* core
mergers and acquisitions, 105
Michigan Typesetting, 108
microfiche, 11
microfilm, 11, 81
microfilm printer, 75
MIT, 105
"mixing" faces, 40
modernization, depreciated machinery deterrent to, 17
modularity, 53
modules, 24
Monophoto, 93
Monotype, 27
MTSC (Magnetic Tape Selectric Composer), 57, 96
MTST (Magnetic Tape Selectric Typewriter), 11, 57, 96
multi-column material, 42
multi-font scanners, 61
multi-pass systems, 57
multi-phase systems, 24, 26, 57
multi-programming, 53

National Computer Analysts, 104
National Geographic Society, 65
National Medical Library, *see* Medlars
new industry combinations, 105
New York Times, 74
newspapers, deadlines of, 32
non-profit bodies, 105

OCR, 28, 56, 63
OCR, multi-font, 61
off-line, 46
off-line keyboards, 96
offset lithography, effect on photocomposition, 12
one-pass system, economies in, 32
"one-time" applications, 58
on-line, 46
operating system, 47
optical character recognition, *see* OCR
optical scanning, *see* OCR
output, 53
outside competition, 104

page makeup, 13
pagination, 13, 24, 44, 53, 56
pagination, *see also* makeup
pagination programs, general purpose, 42
pagination, savings in, 40
pasteup or stripping, 13
patents, 87
PDP-8, 27, 61
Pennsylvania, Commonwealth of, 105
perforation, 20
Permuted indexes, 85
Perry Publications, 62
photocomposition, 58
photocomposition devices, 21
photocomposition systems, 21
Photon, 10, 19, 40, 56, 57, 93, 116
"pi" characters, 98, 100
PIA, 51
Pittsburgh, University of, 105
PL-1, 48
Poole Brothers, 106
powderless etch, 12
PRINT, 16
printing, demand for, 10
Printing Industries of America, *see* PIA
printing industry, characteristics of, 14
printing, market for (elastic), 10
printing, part of knowledge industry, 7
printing, time element in, 10
printing, trade shops, 16
printout, computer, 25, 26, 59, 86
program development, 33
program documentation, 52
program failures, 26
program overlap, 22
programming costs, 33
programs, 24, 45
programs, hot metal, 21
programs, photocomposition, 21
programs, production, 22, 49
proof copy, 23, 26
proofreaders, number required, 100
proofreading, 23, 25, 34
proofs, 58
proofs, galley, 26
proportional spacing, 14, 78

racing publications, 84
Random House, 105

Raytheon, 106
RCA, 31, 106
RCA 301, 19
RCA Graphic Systems Division, 41
rearrangement of data, 65
recoverability, 38
reformatting, 95
reiterative typesetting, 89
re-pagination, 40
reprocessing of text, 38
rerun time, 33
resequencing, 65
resources, problems of, 113
responsibility, changes in, 97
retrieval, 65, 88
reverse leading, 42, 58
revolution in typesetting, 7, 17
Rice, Stanley, 101
Rocappi, 26, 70, 108

Saunders, W.B., 106
Scan-Data, 61
scanning, optical, *see* OCR
schedules, 86
scholarship, computer as an aid to, 84
Science Research Associates, 106
scientific papers, 66
security lists, 86
Sedgwick Printout Systems, 76, 108
selective extracting, 73
set widths, 54, 112
sequential card camera, 66
Seybold, Jonathan W., 103
Shatzkin, Leonard, 62
Silver Burdett, 105
slave units, 93
slug casting, 19
Smith Kline & French, 74
software, 45
software, uniformity of, 98
sorting and sequencing, 65–66
spacebands, 20
speed of composition, 14
speed of typesetting, 89
Standard & Poor's, 87
standardization of character set, 100
storage devices, 46
storage, disc, 24
storage, interim, 24
storage of text, 60
storage, tape, 24
stripping or pasteup, 13
sub-routines, 22
"systems approach", 27
systems, composition, 19
systems, computerized, 19
systems concept, 50, 54
systems, multi-phase, 24, 32, 58

tabular setting, 52
tape merging or splicing, 23
technology, acceptance of, 91
technology, adaptation to, 91
technology, problems of, 114
telephone directories, 84
text storage, 60
Textran, 61
thesaurus of descriptors, 74
"throughput", 32, 47
time element, 14, 38
Time, Inc., 106
Time-Life, 27, 95
time sharing, 46, 53, 101
timetables, 86
timing, problems of, 113
trade shops, 16, 108
transition, problems of, 114
TTS, 20, 27, 30
typesetter's responsibility, 97
typesetting, economic aspects of, 12–14
typesetting equipment, 54
typesetting machine errors, 21
typesetting, unique position of, 17
typographic variety, 14
typography, economic aspects of, 12–14

universities, application of computer typesetting to, 84
university directories, 65
University Microfilms, 106
updating, 73
updating, savings through, 38
upper and lower case printout, 58

variety in typography, 14
Varitype, 66
verification, 23, 34
vertical justification, 41
Videocomp, 41, 94
volume of typesetting, 89

Washington Evening Star, 13
wholesalers, application of computer typesetting to, 83
"widow" elimination, 42
word division, 20
World Atlas Index, 65

Xerox, 106

This book was set on the Fototronic CRT using
Rocappi programs for format and pagination.